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AMERICAN AND OTHER PATENTED INVENTIONS.

JANUARY, 1834.

TO THE COMMITTEE ON PUBLICATIONS.

Observations on the Disturbance in the Direction of the Horizontal Needle, during the occurrence of the Aurora of July 10th, 1833. By A. D. BACHE, *Prof. of Nat. Philos. and Chem. in the University of Pennsylvania.*

(WITH A COPPERPLATE.)

GENTLEMEN,—In the number of this Journal for July last, I gave an account of a disturbance in the direction of the horizontal needle, during the occurrence of the Aurora Borealis, on the 17th of May. On the occasion of the brilliant aurora of the 10th of July, I had a remarkably favourable opportunity of observing a similar disturbance, and as the subject is one which is considered as requiring further observations for its elucidation, I send you an account of those made on the evening referred to.

The needles with which the observations were made, are the same which were referred to in my note of observations made in May. Their places had remained unchanged from that time; the horizontal needle out of doors, under a small wooden enclosure; the horizontal needle within doors on a table placed against a partition wall in my study; the dipping needle out of doors in a small observatory con-

structed entirely of wood, copper, and brass. The needles out of doors have only the local attraction unavoidably incident to a city location, that within doors has, of course, an irregular and more considerable attraction to affect it. The latter needle is exposed to very slight variations of temperature. These particulars are probably sufficient for the present purpose.

I first saw the aurora on the evening of the tenth of July, at three-quarters past nine o'clock; it appeared then as a low nebulous light, resting upon dark clouds, and interspersed by them, but was not sufficiently brilliant to make me entirely certain that it was an aurora: the test afforded by the magnetic needle shows that the phenomena began before this time, and the attention of my observer had been so far drawn towards the sudden diminution of variation at nine o'clock, that an inaccuracy in the observation was suspected, and the needle recurred to, at five minutes past nine, to verify the result before obtained. At ten o'clock, the light in the north was more distinct, extending upwards, nearly 30° from the horizon. At this time I began a systematic set of observations, which were continued until one o'clock on the morning of the 11th. By going a short distance from my dwelling to the east, I have a tolerably good view of the north-eastern portion of the horizon; by going a greater distance to the west, a complete view of the north-western portion, and from the top of my dwelling a tolerable field of view to the north.

At ten minutes past ten the light of the aurora was as brilliant as at the last observation, the brightest portion extending from twenty to thirty degrees east of the north point, and the diffused light extending at least 60° from the north towards the west. The upper limit of the light was a waving line declining rapidly in the eastern portion, and more slowly in the western part. The substratum of black clouds (cumulo stratus) from behind which the aurora appeared to emerge, and which at ten o'clock extended about eight degrees above the horizon, had risen, and a number of small and very black clouds (cumulus) appeared, intercepting portions of the light. At fifty minutes past ten, the waving line, forming the top of the nebulous light, had become more regular, its elevation not being, in any part, more than 12° above the horizon, its extent being about 100°. The floating hill clouds (cumulus) had elongated, diminishing in number, but increasing in size. I supposed the phenomenon to be passing off, when just before twelve o'clock commenced the most brilliant display which I remember to have seen. At twelve, the nebulous light had risen in an irregular line nearly 40° above the horizon; and to the westward of north, apparently emerging from behind the luminous cloud, were diverging beams of light, more brilliant than the body of the aurora, varying constantly in the degree of brightness, and in extent. The appearance at within a few minutes of the time mentioned, I have attempted to represent in the annexed figure, (Fig. 2, Plate I.) When I speak of the beams being diverging, I mean, of course, that they *appeared* to diverge; the point of divergence was below the horizon, but its position I could not, at any time, determine to my satis-

faction. The phenomenon resembled, in form, the beams sometimes seen in the eastern part of the sky when the sun is setting, and which appear to proceed from a point below the eastern horizon, except that these beams were of a beautiful light, apparently streaming from behind a cloud of light. There was at this time no dark cloud visible to the north.

Of the beams which I have endeavoured to describe, those nearest the north faded first, and new ones sprang up further to the west of north, much exceeding in apparent breadth those seen near the north. Small black cumulus and cumulo stratus were scattered through the cloud of light. At eight minutes past twelve, four beams were visible, the broadest being furthest to the west; the last beam died away at twenty-five minutes past twelve, vanishing, after appearing to move westward, about 60° west of north. The general light to the north was still bright, and at half past twelve the most luminous point was about 15° west of north. At one o'clock the aurora had almost ceased, there being still a feeble and diffuse light to the north. A dark cloud (cumulo stratus) occupied a portion of the horizon, having above it two smaller clouds of the same description; in the intervals between these clouds, and to the eastward of the one in the horizon, the feeble light was seen.

In the following table of observations on the magnetic needle, the results which belong to the horizontal needle are referred to the same point, as a zero: to which those in May were referred; this point is not the mean of the days immediately preceding and succeeding the tenth of July, but a reference to it renders the results of the present series immediately comparable with that for May. In the observation of the dipping needle I have been perplexed by a defect of which this is not the place to give an account, but which it is necessary for me to allude to, as explaining why the observations of that needle, made prior to half-past ten P. M., are not given: those which are set down, I have referred to the first observation recorded, as a zero; as differential results, I believe them to be worthy of confidence, though not in the same degree with the corresponding ones for the horizontal needle. The differences marked + correspond to an increase of dip, and those marked — to a decrease. In the column of remarks the different phases of the aurora are briefly referred to.

Time of observation.		Horizontal Needle.				Dipping Needle.		Remarks.
		Changes of variation, needle out of doors.	Attached thermometer.	Changes of variation, needle within doors.	Attached thermometer.	Changes of dip.	Attached thermometer.	
Hrs.	Mins	Mins.	Fah.°	Mins.	Fah.°	Mins.	Fah.°	
July	10							
A.M. 8	30	— 8.0	62					
9	00			— 1.0	74			Wind N.W.
11	00	— 5.0	74	+ 1.0	75			
12	00	0.0	78	+ 2.0	75			
P.M. 1	15	+ 1.5	81	+ 3.0	76			
3	00	+ 4.5	84	+ 4.5	76			
4	00	+ 3.0	83					
5	00	+ 1.5	80	+ 4.5	76			
6	00	+ 3.0	78	+ 6.0	75			
9	00	— 24.5	70	+ 3.0	72			
,,	05			— 2.5	72			
10	00	— 27.0	67½	— 9.5	71			Clear.
,,	20	— 28.5	67	— 9.5	71	0.0	66.3	Aurora bright.
,,	30	— 29.0	67	— 9.5	71	+ 6.5	66.3	Less bright, extends about 60° around horizon, and is from 12° to 15° in height, at the highest point.
,,	40	— 28.5	66¾	— 9.5	71	+ 5.0	66.0	Dark cumulo stratus to N.
,,	50	— 24.5	66½	— 8.0	71	+ 2.0	65.5	Aurora decidedly diminished. Wind variable, N.E. to S.E.
11	00	— 18.0	66	— 8.0	71	+ 0.5	65.2	Aurora 5° to 6° high, very bright, — a faint light rises about 15°. Clouds have changed since last observation.
,,	10	— 12.5	65½	— 6.0	71	— 2.5	65.0	Brighter than when first seen at 9¾ hours.
,,	30	— 9.5	65½	— 4.5	71	+ 0.5	64.8	Aurora faint as at 9¾ h'rs.
12	00	— 25.5	65	— 6.0	70	+ 2.0	64.4	See fig. 2, Plate I.
July	11							
A.M. 12	08	— 21.0	64¾	— 6.0	70	— 5.5	64.2	Beams move to W. of N.
,,	20	— 10.0	64½	— 4.5		— 0.5	63.8	
,,	30	— 19.5	64¼	— 2.5		+ 2.0	63.8	Last beam dies away at 12h.25mins, 60° W. of N.: the N. still bright: brightest spot 15° W. of N.
1	00	— 4.5	63¾	— 1.5		— 5.5	63.2	Aurora nearly gone: the light still appears to the north where the clouds are drawn up.

In examining the column of this table which contains the observations on the horizontal needle out of doors, there appears a remarkable decline of westerly variation, a movement of the north pole of the needle to the east, at some time between the hours of six and nine, P. M. This variation goes on diminishing until between thirty and forty minutes past ten, after which, with the diminished brilliancy of the aurora, the north pole of the needle begins to move westward. This motion was so regular, and its correspondence with the decrease of the brightness in the northern light so complete, that I supposed the phenomenon about to cease, and left my station on top of the house to examine the record of observations already made. On observing at twelve o'clock, I found to my surprise, that the north pole of the needle had again moved eastward, as shown in the table, and on passing rapidly into the street, the beautiful beams of which I have spoken were seen: this sight I might have missed, having supposed the aurora to be disappearing, but for the warning given by the needle. It is not improbable, from the general course of the phenomenon, as already described, that the beams which I saw first to the west of north, were not the first which had appeared, and that others which preceded them may have been to the east of that point. The variation did not reach as low a point during the brilliant part of the phenomenon as during the former part, the observation at half past ten giving a variation less by $3\frac{1}{2}$ minutes than that for twelve o'clock; it is possible, however, that the second minimum occurred between half past eleven and twelve o'clock. At one o'clock the disturbance of the variation had not ceased, though it had become comparatively trifling, and the northern light had not entirely disappeared. This I have reason to believe was the last part of the phenomenon.

In order to present the results just stated in a form which addresses itself more readily to the eye, I have traced (fig. 1, Plate I,) a broken line, in which the intervals between the vertical lines represent the intervals between the times of observation, and those between the horizontal lines the differences of variation. In other words, the abscissæ of the line correspond to the times of observation, and the ordinates to the amount of variation. From this figure it is at once observable that the westerly variation increased irregularly from $8\frac{1}{2}$, A. M. until 3 P. M., when it attained a maximum; that the decrease from this maximum was also irregular, and very rapid between six and nine, P. M.: this includes a portion of the time of the occurrence of the aurora, and the striking irregularities, which follow, in the broken line, represent, those of the phases of the aurora; the second minimum, at, or before, twelve o'clock, corresponding to the time of the occurrence of the diverging beams.

Recurring to the table, to trace the changes of variation in the needle within doors, we find it after nine, P. M. sluggishly following the changes of the needle out of doors, the north pole moving three minutes of a degree to the westward between six and nine, P. M., while the same pole of the needle without doors moved over 27.5 minutes: suddenly obeying the force which had already moved the

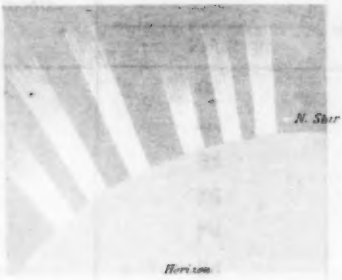
needle without doors, the variation diminishes 5.5′ of a degree in five minutes; between nine and ten, P. M. the diminution amounting to 12.5′, while that of the needle without, was but 2.5′. At this point the needle within is stationary until after a decided impression has been made upon the other needle, of which the variation began again to increase. This increase is observable from forty minutes past ten until half past eleven, between which observation and that at twelve, the variation of the needle within doors has diminished 1.5′, and that without doors 16′. It should be observed that while this needle regained at twelve o'clock the place which it had at half past eleven, the one out of doors passed the corresponding point to the eastward, and was further to the east than at fifty minutes past ten. The correspondence in the motion of the two needles, in any of the intervals between two consecutive observations, though a general one as to direction, is by no means the same in relative amount.

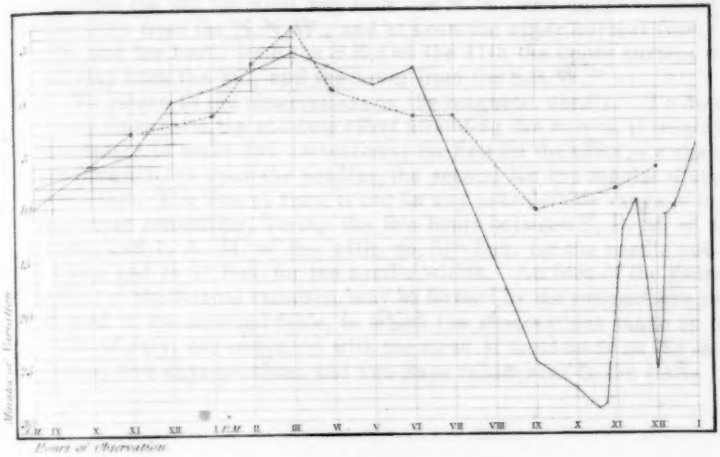
It cannot fail to strike any one who attentively examines the foregoing table, or the line traced to represent the results, that the great *changes* in variation, the motions of the north pole of the needle to the east or to the west, take place rapidly at the beginning of changes in the phenomenon, and that the needle moves but slightly during the continuance of the same class, and degree of brilliancy, of appearances. The beautiful connexion which seems thus to be shadowed out between the effects of electricity in motion, as recently developed by the researches of Faraday, and these observed effects, is too obvious not to strike the mind even of one more intent upon recording facts than of hazarding speculations.

The results of observations upon the dip recorded in the sixth column of the foregoing table, are not altogether regular. Between ten, P. M. of the 10th, and one, A. M., of the 11th, there is a decrease to a minimum, which is sufficiently regular, a subsequent increase followed by a very sudden decrease, and a second increase, which is followed by as sudden a diminution. With such irregularities before one, it would be ill judged to attempt any conclusion from the apparently regular portions of the changes in dip: further observations may throw light upon the causes of the discrepancies, and I have recorded them here, principally with that view. For future observations I hope to have another instrument in which the defects of the present one will be remedied; the results then obtained may give a confidence which I do not now feel in those furnished by the present instrument.

The meteorological changes which took place about the time of the occurrence of this aurora, are worthy of record. On the morning of the 9th of July there was an irregular rain, with the wind at west, terminated by a shower at noon, and succeeded by a clear afternoon, with the wind at west and north-west On the morning of the 10th, the wind was still from north-west, but in the evening had hauled round to the east and south-east.

I subjoin an extract from the meteorological diary kept by James


N. Star
Horizon


Hours of Observation

P. Espy, Esq., which shows a sudden diminution in the amount of vapour in the air, between the 9th. and 10th. of July. The remarks in relation to the winds agree with those already given.

Day of the month.	Temperature at noon.	Dew point.
	Fah.°	Fah.°
6th.	82	53
7th.	—	70
8th.	86	71
9th.	79	65
10th.	78	51
11th.	83	55

"On the 9th the wind was from the N.W., and on the morning of the 10th from the N.N.W., and at noon the upper current from the W. and the lower from the S.E.; on the 11th the upper current was all day from the W., and the lower from the S.S.W."

To return to the observations on the magnetic needle. To determine from them the absolute effect attending the aurora, it would be necessary to make two corrections; the first for the effect of a change of temperature upon the needles, the second for the regular diurnal variation. The first of these is not for any considerable range of temperature amounting, during the few hours between 9, P. M. of the 10th, and 1, A. M. of the 11th, to $6\frac{1}{4}°$ Fah. for the needle out of doors, and to 2° Fah. for the needle within. An idea of the general effect of the diurnal variation, may be formed by the comparisons contained in the annexed table, in which the observations made on the 10th of July, are compared with the mean of those made on the same hours, two days previous, and two days subsequent to the 10th.

Time of observation.	Horizontal Needle out of doors.				Difference of variation.	Horizontal Needle within doors.					Remarks.
	Mean changes of variation and temperature on 8th, 9th, 11th, and 12th of July.			Changes of variation & temperature on 10th July.		Mean changes of variation & temperature on the 8th, 9th, 11th, and 12th of July.			Changes of variation & temperature on 10th of July.		
Hours.	No. of obs'ns.	Min's.	Fah.°	Min's.	Fah.°	Min's.	No. of obs'ns.	Min's.	Fah.°	Min's.	Fah.°	Min's.	
A.M. 8½	4	— 10.0	69	— 8.0	62	+ 2.0							
9¼	3	— 8.0	73				4	— 3.0	77⅞	— 1.0	74	+ 2.0	
11	2	— 3.0	75	— 5.0	74	— 2.0	2	— 2.5	81½	+ 1.0	75	+ 3.5	
P.M. 1	2	— 1.5	82	+ 1.5	81	+ 3.0	1	+ 2.5	83 ?	+ 3.0	76	+ 0.5	
2	4	+ 3.5	85				4	+ 0.5	83				
3	4	+ 7.0	86½	+ 4.5	84	— 2.4	4	+ 1.5	82½	+ 4.5	76	+ 3.0	
4	3	+ 1.0	85	+ 3.0	83	+ 2.0							
6	2	— 1.5	80	+ 3.0	78	+ 4.5	2	+ 2.0	79	+ 6.0	75	+ 4.0	
7	3	— 1.5	82										
9	2	— 9.5	75½	— 24.5	70	— 15.0	3	+ 0.5	76	+ 3.0	72	+ 2.5	Aurora. (?)
10	4	— 9.5	75	— 27.0	67½	— 17.5	3	+ 1.0	76	— 9.5	71	— 10.5	Aurora.
11	2	— 8.5	74	— 18.0	66	— 9.5	4	+ 1.5	74⅛	— 8.0	71	— 9.5	Bright.
12	2	— 6.5	71½	— 25.5	65	— 19.0	1	+ 3.5	74	— 6.0	70	— 9.5	Do.

In this table the columns are arranged as in the foregoing one, additional columns being introduced to show the number of observations from which the mean is obtained, and to give the differences between the changes of the 10th and the mean changes. The com-

parison with the variation on the 10th. is assisted in the case of the needle out of doors by the curve of mean variation being traced in a dotted line upon fig. 1, Plate I. In following the curves we see the increase from the morning minimum, at, or before, 8½ A. M., to the day maximum at 3, P. M., and the subsequent descent towards the evening minimum, with an irregularity in the progress of the variation, observable at 7, P. M. on the 10th of July. The lines now cease to have even the most general resemblance. The descent towards an evening minimum at 9, P. M., which appears upon the line of mean variation, concurring with the descent attending the aurora, might be supposed to have produced the suddenness of the effect noted, were it not that a similarly rapid fall occurs between half past eleven and twelve o'clock, contrary to the direction of the line of mean variation. It is possible that the coincidence in the direction given by the diurnal variation with that of the change attending the aurora, between eight and nine, and their opposition between half past eleven and twelve, is the cause of the first minimum being lower than the second, supposing this to have been at 12 o'clock, since the difference between the second minimum and the mean is greater than that between the first and the mean, by four minutes. At 1, A. M. of the 11th, the needle appears to have regained about the mean position, the variation being rather more than the proportional mean for that hour, supposing the increase from twelve to one, to be the same as that from eleven to twelve. Midnight is about the hour of the night minimum, which, however, not unfrequently occurs, after as well as before, that time.

The conclusions deduced from the observations on the needle within doors, coincide, generally, with those obtained from the one without.

Having made material improvements in the needles referred to in this paper, and completed two small observatories in the yard attached to my dwelling, expressly for magnetic observations, I purpose to follow out this subject, and in connexion with it to study the effect of meteorological changes, and, as necessary to the solution of these questions, to preserve an account of the diurnal variation, in such a way that the requisite corrections for the temperature of the needles may be applied. Thus I hope to be able to make a contribution towards determining a question to which the attention of men of science has been particularly called by the recent discussions in the British Association for the Advancement of Science.

Philadelphia, December 24th, 1833.

Notes of an Observer.—Meteorology.

FOR THE JOURNAL OF THE FRANKLIN INSTITUTE.

In the American Journal of Science and Arts for October, 1833, there are two well written articles, by Mr. Redfield, on Meteorology. They contain a most laborious collection of facts, which, if well authenticated, will be of immense importance to meteorological science. Some of them, however, are so anomalous and inconsistant with re-

ceived theories, that I hesitate to put entire confidence in them, and shall continue to doubt until I have the most certain evidence of the facts.

For example: In page 132, he says, "In large portions of the Pacific Ocean, the tides are exempt from the lunar influence. At Tahiti, and the Georgian Group, near the centre of the Pacific Ocean, the tide rises but one or two feet, and it is high water at noon and midnight throughout the year, and this, too, in the very region where the established theory would lead us to expect the lunar tides to be the most regular and powerful." Again, in p. 128, he says, "In Peru, at the height of eighteen thousand feet, the wind has been found to be fresh from the south-west;" meaning, as I understand the whole paragraph, that this is the prevailing direction of the wind at that altitude in that place.

But the chief object which I have in referring to these papers is to correct a very important mistake which will be found at p. 129. The paragraph alluded to is in the following words: "The regular semidiurnal variation of the barometer, in the tropical latitudes, is at its maximum about 10, A. M. and at its minimum about 3, P. M. At New York it is nearly the same; *but at Edinburgh, the effect is reversed, the minimum being at ten and the maximum at three o'clock.* It appears to indicate a system of atmospheric tides resulting from the rotation of the earth, and its connexion with the solar system."

I was startled at this statement, and immediately began to look for authorities to confirm or confute it, when I happened on the following passage in the second report of the British Association for the Advancement of Science, p. 131.

Mr. Forbes there says: "I have investigated with great care during the years of 1827—30, the oscillation in latitude 56°,—the most northerly point in Europe at which any observations of long continuance on this subject have been made. The results have been published at length in the Edinburgh Transactions; and I have also entered into an analysis of all the existing information on the subject. The following are the general results at which I have arrived:—

"1st. That near Edinburgh, in latitude 56°, the mean annual oscillation between 10, A. M. and 4, P. M. is .0106 inch.

"2nd. That the hours of maxima are further from noon in the spring and summer, than in autumn and winter; and that the amount of oscillation of both the diurnal periods diminishes regularly from spring to winter. These conclusions, derived directly from my own observations, I have shown to be the most probable for all parts of the globe, as far as existing observations guide us.

"3d. That the St. Bernard observations, (8000 feet above the level of the sea:) and those of Captain Parry in the arctic regions, both indicate a *true* negative oscillation, though the second result has been overlooked by M. Bouvard."

The cause of these diurnal oscillations of the barometer was explained in the 8th volume of this Journal, p. 389, and it may be here observed, that the theory there given will show why the oscillations at great elevations, such as St. Bernard, should be negative; at least why the barometer should stand higher at three o'clock than at ten.

If we suppose the air below the level of St. Bernard to be ten degrees warmer at three than at ten in the morning, its expansion will be a little less than $10 \times \frac{1}{480}$ of the whole: because its mean temperature is above 32° Fah. Let us call it $10 \times \frac{1}{500}$ of 8000 feet, and it will appear that 160 feet of air is thrust upwards by expansion from heat, between the hours of ten in the morning, and three in the afternoon, above the level of St. Bernard, which will cause an elevation in the barometer of .016 of an inch. This will be quite sufficient to cause a negative oscillation of the barometer, if these two hours only were considered, ten in the morning, and three in the afternoon. But it must be acknowledged that it leads to the conclusion that at these great altitudes there should be found only two diurnal oscillations, of which the maximum would be about three o'clock, and the minimum just before sunrise. If I had the St. Bernard observations I would examine them to see whether the facts would justify the theory. If it should be found that there are four diurnal fluctuations at St. Bernard, all negative, it will refute the theory here given; for, according to it, the barometer ought to rise more rapidly from sunrise till ten o'clock, than in the plane below, from the combined influence of the increasing *elasticity* of the air, and the increasing *weight* of air above the level of the plane of observation. And it was shown, in the essay mentioned above, that the former of these alone is the cause of the rise in the plane. Perhaps some gentleman who has access to the St. Bernard observations, may be satisfied of the plausibility of these remarks, and be induced to take the trouble to make the investigation.

As to the oscillations in the arctic regions, whether they are positive or negative, they will not invalidate the theory given above. For the causes assigned do certainly exist, and certainly produce, in whole or in part, the very phenomena observed. I may not have assigned the exact difference of temperature of the air below St. Bernard at 10, A. M. and 3, P. M., but that there is some difference no one can doubt.

I do not know that any observations have been made to ascertain how much the air is heated diurnally at great heights by the rays of the sun; and I would propose these very oscillations of the barometer at St. Bernard as a means of ascertaining that fact; for it is plain that the more it is heated, the greater will the rise of the barometer be at the warmest part of the day, as the quantity of air raised above St. Bernard by expansion, will be in exact proportion to the rise in temperature of the whole mass of air below the place of observation.

Remarks on instruments for Measuring Distances at a single observation.

FOR THE JOURNAL OF THE FRANKLIN INSTITUTE.

In the Journal for March, 1833, there is a notice of a reflecting instrument for measuring distances at a single observation, invented by Nathan Scholfield, of Montville, Connecticut. In this instrument two mirrors are arranged in the same line from the eye, one of which

is movable on an axis. The distance of these mirrors is the known base of a right angled triangle.

Since reading this notice, I have ascertained, that the project of measuring distances by a single observation is not new, although probably the instrument of Mr. Scholfield will be found more simple and useful, than any previously invented. The following instrument was described by Wm. Pitt, of Pendeferd, England, in 1795.

ABCDE, the instrument *in plano;* O, the object, whose distance is required; at A, at C, at E, and at 3, are to be fixed speculums, properly framed and fitted, that at 3 having only its lower part quicksilvered, the upper part being left transparent to view the object; the speculum at A being fixed obliquely, so that a line A 1, drawn perpendicular to its surface, may bisect the angle B A C; that at C being perpendicular to the line C 2; those at E and 3 being perpendicular to the index E 3, and that at E being furnished wth a sight; the arch D C to be divided from D in the manner of Hadley's quadrant; the movement of the index to be measured by a micrometer. The object being received on the speculum A, is reflected into that at C, and again into that at E, and that at 3 on the index; the index being then moved till the reflected object in the speculum at 3 exactly coincides with the real object in the transparent part of the glass, the divisions on the arch D 3, subdivided by the micrometer, will determine the angle D E 3 = the angle A O E; from which the distance O may be determined. The instrument may be adjusted by holding up a staff at a distance whose length is exactly equal to A E."

It is to be hoped that Mr. Scholfield will perfect his instrument, which may be very useful at sea in ascertaining at once the distance of ships, rocks, and capes. The accounts of foreign inventions inserted in the Journal of the Franklin Institute, are very important, both as sometimes furnishing hints to American genius, and as preventing the needless toil of genius to discover what is already known. The waste of money, also, in obtaining invalid patents for things already published, is to be taken into consideration. If the Journal of the Franklin Institute were more generally read by American inventors, it would save much waste of money and of genius.

Brunswick, Maine, Nov. 29th, 1833. A.

Remarks on the Culture of Seeds for, and the Manufacture of Vegetable Oils. By CHARLES V. HAGNER, *Manayunk, Philadelphia county.*

FOR THE JOURNAL OF THE FRANKLIN INSTITUTE.

I was much pleased to find in the Journal of the Franklin Institute for November, an essay containing some useful hints on the subject of the manufacture of vegetable oils. I have long been asto-

nished that a subject of so much importance to the agricultural, manufacturing, and commercial interests of our country, should be so long neglected, and that more attention has not been paid to it. I am perfectly convinced that there are many seeds from which oil for various purposes could be produced, and which could be grown with great advantage to the agriculturist. All that is necessary, is to draw his attention to the subject, and induce him to make the experiment. It is but a few years since the Palma Christi, (Castor Bean,) was first grown in quantities in this country, yet the introduction of it here has had the effect, as almost every one knows, of improving infinitely the quality of the oil, and of supplying the market at from two to three hundred per cent. cheaper than was paid for the nauseous and miserable stuff, formerly received from the West Indies and elsewhere.

One of the seeds mentioned by your correspondent, colchicum or rape seed, is of the greatest importance, and produces an oil which is, and has long been, much wanted for manufacturing purposes. This seed is grown abundantly in all parts of Europe, and the oil made from it is extensivley used in the process of manufacturing cloth; it is, I believe, the cheapest oil they have, and takes the place of the common kinds of olive oil, which the manufacturers of this country are obliged to use at a great cost: this is a matter of considerable importance, when it is known that to every 100 pounds of wool carded, there is consumed from two to three gallons of oil. The rape seed oil is so cheap and abundant in Germany that it is much used in adulterating linseed oil; hence the bad quality of some of the German paint oils, as the rape seed oil does not possess the drying qualities of that from flax seed, and is therefore unfit for the purposes of painting, &c.

Having been for a long time engaged in the manufacture of flax-seed oil, and having made various experiments on other seeds, I have, of course, had some experience on the subject. In relation to rape seed I had an excellent opportunity of making full and satisfactory experiments. In the year 1822 or 1823, an English gentleman who was familiar with the culture of rape seed, and who had a farm somewhere in the neighbourhood of Salem, N. J., brought to my establishment about forty bushels of rape seed, which he had produced upon his farm. The account he gave me of its culture was this. Two acres were sown with this seed, (broad cast) in the month of August; it sprouted, and was growing very handsomely, but late in the fall the cattle broke into it, and as he thought completely destroyed it; he abandoned the experiment, and suffered his cattle to roam in it all winter; but in the spring, observing it sprouting again, he put up the fence, and as he expressed himself, "let it take its chance." The two acres with this, as he considered it, unfair experiment, produced him about forty-four bushels of seed, for which I offered him four dollars per bushel, which he refused to take. I expressed it for him, and although my apparatus was not by any means perfectly adapted to the purpose, the manufacture differing in some respects not necessary to state, from that of flax seed oil, I produced three and a half gallons per bushel. The cake, that is, the pulp after the oil is ex-

pressed from it, he valued highly for fattening cattle, and refused to take seventy-five cents per bushel for it; the oil he sold to a woollen manufacturer for one dollar and thirty cents per gallon; thus, including the cake, realizing five dollars and thirty cents per bushel, out of which was paid the expense of manufacturing. It is, I am told, considered in England a profitable crop, although the price is not much, if at all, above two dollars per bushel. The gentleman was in high spirits as to the result, and told me he intended to go into the culture of it more extensively, but from what cause I do not know, I have never seen him or heard from him since—whether he failed in his after experiments, died, or returned to England, I do not know; I have not, however, the least doubt that our soil and climate are well adapted to the culture of this seed; it is of the same family with the cabbage, which every one knows grows luxuriantly here. We have, besides, such a variety of soils and climates in our country, that if it will not succeed in one district it certainly will in some other.

Another seed valuable for oil is the sun flower: I have never tried this, but am told it produces a very excellent salad oil; I have no doubt the culture of it, properly managed, would be both useful and profitable.

The bene seed cultivated in the southern states, produces a valuable oil, and yields more than any seed I know of; it is said that one hundred pounds of seed produces ninety pounds of oil. I never tried the experiment fairly, but have no doubt as to the fact; some years since I expressed a barrel of the seed, but do not now remember the quantity produced; it was, however, such as to astonish me. The seed was eight years old, and had become in a manner rotten and rancid, the oil of course was not fit for the table, but it was, nevertheless, beautifully transparent and fluid, more so than any I had ever seen. It struck me that it might perhaps be valuable for watch makers. I believe I have a small quantity of it left, and should like some one who knows more of that matter than I do, to try it.

The common thin-shelled pig nut of our country, is said to make an excellent salad oil; the manufacture of it is easy; the shell is so thin as to interfere but little in the process; the nut is put into the mill, and ground up without removing the shell.

The cotton seed, if hulled, will yield a large quantity of oil, and I am glad to learn that attention is being paid to it. I once manufactured a small quantity, grinding the hull and cotton fibre with it; the quantity of oil produced in this way will not of course pay the expense of manufacturing it, so much of the oil being absorbed by the hull and cotton. Your correspondent does not appear to be practically acquainted with the plan of taking off the hull which he suggests, by means of a barley hulling machine. It is totally impracticable, for the following among other reasons: first, if the result could be accomplished in that way, the expense of power, labour, &c. in so doing, would be such as to leave little or no profit; it would, in fact, be much more trouble and expense than all the rest of the process of making the oil: second, the seed cannot be hulled in that way; I speak from experience, being practically familiar with the process of

hulling barley; the reason is, that when the grist is put into the machine, and the stone had penetrated through the hull, and come in contact with the soft and greasy parts of the seed, it would become so greased, or to speak technically, glazed, as to render it perfectly incapable of doing any more work; the seed would then come out in pretty much the same condition that it went in. I rather think that a method similar to that which is used in chocolate mills for separating the hull from the cocoa, would be more feasible. The nuts are broken up by being passed through rollers of a peculiar construction, and the shell is afterwards blown out by a common fan. The objections to this plan are, the difficulty of breaking up the cotton seed, on account of its toughness; the further difficulty, from its adhesiveness, of separating the hull from the kernel of the seed. I have been told that some person at the south has succeeded in making a machine for hulling cotton seed, and I perceive among the list of patents in the Journal for November, one for a machine for that purpose; the description of it, however, is so imperfect that I cannot exactly understand the nature of it. If, as is said, it does hull one hundred and fifty bushels per day, it is an important matter, and the object is attained.

The above remarks have been hastily thrown together, after reading the essay above alluded to; they come from one who is in a measure practically acquainted with the subject, and may perhaps answer some useful purpose.

Manayunk, December 16th, 1833.

FOR THE JOURNAL OF THE FRANKLIN INSTITUTE.

Description of a Wooden Pendulum Rod, secured from the action of moisture. By WM. HOWARD, *U. S. Civil Engineer.*

This pendulum is similar to that contrived by Captain Kater, and described by him in Nicholson's Journal, for July, 1808, and in Lardner's and Kater's Treatise on Mechanics. The only difference consists in the method of securing the wood from the influence of the hygrometric state of the atmosphere. This is done by taking advantage of the property of thin metal plates, of *buckling*, as the workmen term it. The annexed figure represents the manner in which this is contrived. A rod of prepared wood of convenient size, is hermetically enclosed in a box of thin tin, or brass, made to fit on it loosely. The supports, for the spring above at A, and for the nut beneath at B, project through the ends of the box, the openings being made air-tight by solder, and are fastened to the wooden rod in the ordinary way. The box does not continue of the same size, throughout its whole length, but is enlarged at C D, to form a flat case, projecting about half an inch from the rod every way. The springing, or buckling, of the top and bottom of this case, is intended to allow the metal to expand and contract freely, without

affecting the wooden rod; which is at the same time, entirely secured from the exterior air.

The small quantity of motion required for this purpose, will not render it necessary, in all probability, to enlarge the case C D beyond the size we have here assigned to it. If we take the expansion of rod iron as given by Mr. Hassler, we shall find, that, for a difference of temperature of 100° Fahr., and a length of rod of forty-three inches, the quantity of motion to be provided for, will be only $\frac{3}{100}$ths of an inch, even supposing the wood to be unalterable in its length.

The proper place for this case I have deemed to be two-thirds of the length of the rod, or as near as may be to its own centre of oscillation.

Should it be desired to compensate the small expansion and contraction, by temperature, of the wood thus protected, this could be easily effected by using either zinc or lead, according to the plan either of Capt. Kater, or of Mr. Bailey, described in the Treatise on Mechanics, above referred to.

I propose, as soon as I can procure a pyrometer of sufficient delicacy and exactness, to examine the expansibility, by heat, of the different kinds of wood, taken in various directions to the fibre, and secured in metal boxes in the manner above described.

On the Causes of Spontaneous Combustion.

TO THE COMMITTEE ON PUBLICATIONS.

Gentlemen,—I wish, through the medium of your Journal, to solicit the attention of some of your scientific readers to the causes of spontaneous combustion, generally; and with a view particularly to the investigation of those causes that are liable to produce it in cotton, woollen, and paper factories, from the stock, or waste, being accidentally impregnated with oils, or other substances.

As very few manufacturers are sufficiently acquainted with chemistry to determine accurately the causes of the effects which they may observe, it is therefore desirable that men of science, who have leisure, inclination, and information,* adequate to the task, should undertake, and perform, a series of experiments on the intermixture, or chemical combination, of different materials, together with the proportions, situations, degrees of heat, &c. requisite, in each case, to produce spontaneous combustion, and that publicity should be given to the same through the pages of this Journal.

The vast amount of capital invested in various kinds of manufactures, and the large number of mechanics and workmen of every grade and description, who are interested, either directly or indirectly, in the safety and prosperity of our factories, whose daily support and almost sole means of accumulating property, are derived from their employment therein, all unite in the requisition.

It is confidently believed that many buildings have been destroyed

* Our correspondent has forgotten an important item, viz. *means*.—Com. Pub.

by fire, originating in spontaneous combustion, and that there is frequently great danger, where it is least suspected.

To aid in the inquiry, agents and superintendents, as well as the observers in the several departments of factories, should unite in communicating such cases as may have come within their notice, together with such facts and circumstances as attended them.

To contribute my mite, I will give an account of the few instances that are within my knowledge, although my statements cannot be as detailed as I could wish, from my not having paid much attention to the subject at the time the observations were made.

The first instance of spontaneous combustion, or that which was apparently so, and was not otherwise accounted for, was in a quantity of wood ashes.

The ashes were in the body of an old wagon, with boards above, at the sides and ends, and had been accumulating for more that two years, to the amount of fifty bushels, or more. The ashes belonged to a very careful man, if the epithet is not altogether inapplicable to a person who would deposit ashes in a wooden vessel, whose constant custom was to have his ashes taken up from the hearth in a metallic vessel, and stand therein until entirely cold, before they were put into the usual place of deposit, and no danger was apprehended from this practice.

One evening about sunset, smoke was perceived to issue from the body of ashes, and it was at first supposed that one of the domestics had, contrary to strict orders, put in some hot embers; but on inquiry it did not appear that any ashes had been added for three days, and this appeared the more probable, as several vessels were then found standing full of ashes which had been taken up.

When the fire was discovered, it was expected that it was confined to a small spot only, and that a small quantity of water would be sufficient to extinguish it, but on pouring water upon the mass, the ashes were scattered very extensively, and on further examination, it was found that the boards in several places were burnt almost through, and that the whole quantity of ashes was in a state of ignition like embers immediately from the fire. Nothing but a timely discovery prevented the destruction of a large portion of a village, for the buildings were all of wood, and so situated that the chance of saving one out of twenty would have been but very small.

I should be glad to throw some further light on this subject, but every thing else in relation to it was mere conjecture, and whether some oily substance was accidentally intermixed with the ashes, or was introduced by carelessness, or otherwise, or from what cause the combustion was produced, remains entirely unknown.

Instances have been known in which cotton has taken fire by wiping up with it oil that had been spilled, both linseed and sperm oil.

Weaver's harnesses in factories are varnished with a varnish made of the following materials, the same, in greater or less proportions, being used by different manufacturers: the usual ingredients are, linseed oil, spirits of turpentine, litharge, red lead, shel lac, umber and India rubber. The composition is boiled down to a thick varnish, and

laid on to the harness with a brush. The harness is usually made of cotton twine.

I once knew an instance in which a hank of twine, which was varnished for mending harness, took fire, spontaneously, while hanging to dry.

I mention this circumstance, because in many factories it is customary to varnish and hang the new harness to dry in the garret, or some other spare room of the mill; and likewise to lay away the old worn out harness in the same place, and with very little caution as to the quantity that comes in contact: a practice that may lead to dangerous and destructive consequences.

I hope my remarks will not be deemed irrelevant. It will be readily perceived that my object is, at this time, more to obtain than to communicate useful information.

Very respectfully, yours,

J. A. B.

Pittsfield, N. H., December 2nd, 1833.

FRANKLIN INSTITUTE.

Monthly Meeting for Conversation on Mechanical Subjects.

A machine patented by James Secors, of Bristol, Pennsylvania, for cutting straw, was exhibited. The straw is cut by an oblique cutter, set in motion by a winch, a fly wheel serving to regulate the movement. This machine will be described in the Journal of the Institute.

Mr. Joseph L. Dutton explained by reference to a model, the method of constructing the cloistered arch proposed by him for covering the rooms in the Girard College. This plan of arching has been submitted to the Committee on Inventions, from whom a report may be expected.

Prof. A. D. Bache brought forward the Kaleidorama, a philosophical toy, lately introduced, for illustrating the "memory of the eye." The combinations of motion produced by it, render the exhibitions amusing as well as instructive.

EIGHTH EXHIBITION OF DOMESTIC MANUFACTURES.

Reports of the Judges of the articles exhibited at the Eighth Exhibition of Domestic Manufactures; held by the Franklin Institute in October, 1833.

[Made to the Committee on Premiums and Exhibitions.]

REPORT OF THE COMMITTEE OF JUDGES ON COTTON GOODS.

The committee on cotton goods report that they have carefully examined the numerous specimens submitted to their inspection. It was with great pleasure that they beheld so large a collection of manufactures of native production, evincing the ingenuity, skill, and industry, of the country. The specimens of novelties in the depart-

ment of cotton manufactures, were not numerous, but the general appearance and make of the various fabrics indicated such improvement, as, in the opinion of your committee, will insure a steady and certain advancement towards still greater perfection.

The committee recommend that premium No. 58, be awarded to the manufacturer of No. 384, deposited by Messrs. Haven & Neide, for four pieces of beaverteens of a good and substantial quality, much superior to most of the imported article. No. 384 was the only specimen exhibited.

That premium No. 61 be awarded to William Almond, the manufacturer of No. 12, a specimen of power loom woven Marseilles, which is considered as a very fair effort: there is, however, great room for improvement in the article. No. 286, manufactured by the Hamilton Manufacturing Company, consisted of six dozen of cotton towelling, of a good quality, and well made.

That premium No. 64 be awarded to the Merrimack Manufacturing Company, for Nos. 263 and 264, rich chintz prints, being of superior excellence in style, and displaying colours of great brilliancy; other specimens from the same factory deserve much praise, for general style and execution. The prints from the Phœnix Works were of a highly improved character, of superior cloths, and at least equal in style to any exhibited, and would have commanded the premium, had the colours been more clear and decided. The prints from the Eagle Works and Cochico Manufacturing Company, were also highly meritorious, and together with those already mentioned, afford ample proof of astonishing advancement in this branch of manufactures.

The committee further recommend that premium No. 63 be awarded to the Bristol Print Works, for No. 55, the only sample of furniture chintz exhibited; the colours in these goods are vivid, and the patterns showy: in this article there has been great improvement, which may be carried still further.

That premium No. 72 be awarded to Joseph Ripka, for Nos. 24 and 25, cantoon cords and crape; they are exceedingly good imitations of the foreign article, very durable and desirable goods. The pantaloon stuffs manufactured by the Hamilton Manufacturing Company, are very creditable specimens of the kind. This description of goods is considered as calling for encouragement.

That premium No. 94 be awarded to the York Manufacturing Company, for Nos. 53 and 54, canton flannels; a superior fabric of uncommon regularity of nap, and presenting a beautifully smooth surface. To Mr. William Almond much credit is also due for his specimen of Canton flannels, a substantial article, well calculated for general use. The consumption of this article is very extensive.

For premiums Nos. 57, 60, 67, 70, 71, 73, and 94, no candidates appeared, although it is well known that many of the articles for which these premiums were proposed, are produced by our manufacturers. Perhaps by continuing to offer these premiums competition may be elicited.

For premium No. 59 no samples properly called cambrics, were exhibited, but No. 91, checked cambrics manufactured by Joseph

Bancroft, approaches very near the article sought; it is a very fair specimen of the kind, and entitles the manufacturer to great praise. The demand for this description of goods has been considerable.

For premium No. 65, but one sample was exhibited, No. 205, plate prints, price ten cents, manufactured by W. Wister; these goods are substantial and serviceable. The premium being for the best prints not exceeding 11½ cents per yard, and there having been no competition, your committee decline recommending the award in this case.

For premium No. 68 were exhibited very beautiful specimens of gingham check, Nos. 88 and 89, manufactured at the invaluable institution for the deaf and dumb. It is believed that the number of the yarn is below 45, which will preclude these samples from the premium, but your committee feel great pleasure in witnessing so perfect specimens of workmanship coming from so interesting a source; they cannot refrain from recommending that encouragement be afforded to the maker of these goods, with the view that he and others in the same institution may be stimulated to further exertion.

For premium No. 69, a very handsome sample of linen diapers, No. 99, from the Shakers, was exhibited, but it is believed not in sufficient quantity to entitle them to the premium. The specimen is of a superior make, and shows ability to produce an abundance of an article much used.

The following articles were exhibited for which no premiums were offered:—

Numerous samples of bleached cotton shirtings and sheetings, from various manufactories, possessing all the necessary qualifications which are sought for in this description of manufactures. There is a manifest general improvement in this branch of manufactures.

Very superior and well made cotton canvass, from the manufactory at Paterson, N. J., much used by our shipping.

Coloured cambrics of various qualities and shades, and excellent finish, from the Cochico Manufacturing Company, and Great Falls Company, and others, deposited by Henry Farnum & Co. The home productions of this article have nearly excluded importations.

Sewing and knitting cotton cords, from the factory of Philip Garrett; cotton cords from Enoch Roberts; spool cotton from Joseph Bancroft, are fair specimens, and creditable to the makers; cotton suspenders from Wm. Poole, are of a superior character; checks from Alexander Struthers, are of a very substantial quality.

Britannia handkerchiefs, from James F. Simmons, are pretty specimens of that style of work; of this kind of goods there is great consumption.

Printed cotton vestings, from the Hamilton Manufacturing Company, is a fair low priced article, for the increased manufacture of which there is great room, as the demand is very extensive. An improvement in this article is deemed desirable.

Knotted counterpanes, deposited by Messrs. Haven & Neide, are of a superior quality, and entitled to particular commendation. Your

committee consider this as an article for which a premium might be offered, if produced in sufficient quantity, and at a reasonable price.

Quilts and bed spreads, of great variety and good fashion, all claiming admiration for their fair makers; some of exceeding beauty and neatness, affording ample testimony to the ingenuity, taste, and industry employed in their construction.

With two trifling exceptions the committee believe they have noticed all the articles which are mentioned in the schedule placed in their hands, and it will afford them pleasure if they have been so fortunate as to have performed their duty to the satisfaction of the Institute, and of the several depositors.

GEORGE L. OLIVER,
JOHN COOPER,
AARON KILLIE,
BENJ. W. TINGLEY.

Philadelphia, October, 1833.

Report of the Committee of Judges on Woollen Goods.

The committee of Judges on woollen goods respectfully report:—That in their examinations attention has been directed as much as practicable, rather to the process of manufacturing, than to the material out of which the goods are made, believing that the manufacturer who produced the best article from the same stock, or as good an article from an inferior stock, was best entitled to the commendation and to the premiums awarded by the Institution. The great variety of goods submitted to their examination, has precluded the possibility of a report so detailed as to embrace every article, and they doubt not but much that deserves particular notice and commendation has escaped their observation. They feel themselves, however, fully warranted, and indeed constrained, to bear testimony to the general excellence of the goods brought under their inspection.

The following details will embrace the various descriptions of goods examined by the committee:—

Blankets,—The specimen of woollen and cotton blankets deserves unqualified commendation. The article appears to combine warmth and lightness; and the union of the two materials for that purpose accomplishes a desirable object. The Wilton super blankets are not surpassed by any article in blanketing that has ever been seen by the committee. The whiteness, and the fleecy character of the fabric, deserve special notice.

Flannels.—In this article perhaps much improvement is not to be expected, the specimens exhibited, in the opinion of the committee, sustain the character of the domestic flannel, both for fabric and colour.

Cassimeres.—No. 235, 2 pieces, No. 236, 2 pieces, and No. 237, 2 pieces. The only lot of five pieces submitted to the committee. They appear to be good in the colours, and well made goods; but No.

565, a piece of black, and No. 2121 of lot 238, a piece of striped cassimere, both for closeness of texture and beauty of finish, exceed, in the opinion of the committee, any other cassimere in the exhibition. No. 222, a piece of double milled drab cassimere, is also a well manufactured article. All the specimens are creditable to the manufacturers.

Sattinetts.—No. 229, eight pieces of Oxford mixed, are excellent goods, deserving high commendation, combining width, strength, and beauty in an unusual degree.

No. 45, three pieces of printed sattinetts, also have claimed the attention of the committee. The goods, though light in the fabric, are well made, and the printing is executed in a masterly manner.

No. 272, twilled felting, for paper makers, is a well made article, and appears to be adapted to the purpose for which it is designed.

Cloths.—Nos. 239, 240, 242; fancy colours. These goods appear to the committee the best of the fancy colours; the dye is good, the texture firm, and the finish free from objection.

No. 387, four pieces, No. 388, three pieces; fancy colours. These goods, for lustre and richness of finish, perhaps surpass any other lot in the exhibition. They have also much brilliancy of colour, and the material is worked up to great advantage. The committee have examined them with satisfaction, and commend them with great confidence.

No. 245, three pieces of wool dyed blue, at three dollars per yard; this is the only lot in the exhibition at that price; the goods are well made and well finished.

No. 244. These cloths the committee believe to be the best in the exhibition, and they assign some superiority to that with the private number, 29848, over the other two. The excellence of the wool; the texture of the cloth; and the close and neat finish, all combine to recommend these goods. But faithfulness requires that we should state that in these cloths, the listing, or at least portions of it, is sewed on. This practice, too common in American cloths, is reprehensible in all cases, but more to be censured in fine goods, we venture to hope it will soon be abandoned; for besides the loss which the appearance of the cloth sustains from being deprived of the embellishment of a rich listing, the absence of a list united with the cloth in weaving, creates distrust in relation both to strength and colour.

No. 457. An excellent piece of cloth, but little inferior to the goods just mentioned; well made, and free from the objection in relation to the listing, which the committee have censured with perhaps too much severity.

No. 231, two pieces of drab cloth, entitled to great commendation for colour, texture, and finish.

No. 232, two pieces of steel mixed cloths; in these goods the colours are well mingled, and the goods excellent.

In giving this brief detail, the committee are aware that they only very faintly convey the impression that has been made on their minds by the examination they have been requested to make; and in closing this report, they beg leave to express their high gratification at the evidence furnished by this exhibition of the excellence of American fa-

brics, and to express the hope that the enterprise and skill which have brought them, in their infancy, so near to the excellence of the best specimens of European productions, will not be relaxed until they attain perfect equality with them.

WILLIAM WORRELL,
JAMES BOGGS,
CHARLES S. WURTS.

Philadelphia, October 5th, 1833.

Report of the Committee of Judges appointed to examine Carpets and Carpeting.

The committee of Judges respectfully Report:

That, on a careful inspection, they were gratified to perceive that the articles now presented in this branch of our home manufactures, will bear an advantageous comparison with those of the previous exhibition.

In the Ingrain and Brussels carpeting, although an improvement in the fabric is not very observable, it is strikingly apparent in the colours and shading. This remark is particularly applicable to the three pieces of superfine ingrain No. 29, from the Lowell Carpet Manufactory, and to the four pieces of Brussels, No. 31, from the manufactory of Mr. John Humphreys, of New York. These goods are of excellent quality and style, and satisfactory assurances have been received that they are exclusively of American workmanship, throughout all the processes, from the raw material to the finished product of the loom; also that the materials are all American, except as regards the ingrain from Lowell, the wool in which is understood to have been imported. The committee consider these specimens, Nos. 29 and 31, entitled to premiums.

The five pieces of Brussels carpeting, Nos. 79, 249, and 250, from the manufactory of Mr. Isaac Macauley, at Bush Hill, near Philadelphia, fully sustain the high character heretofore accorded to similar articles from that establishment. The worsted, however, in the present specimens, although scoured and dyed by Mr. Macauley, was spun in Europe. But for this circumstance the committee might have hesitated in awarding the palm to Mr. Humphreys.

The only piece of Venitian carpeting exhibited, viz. No. 489, manufactured by Mr. John M'Fee, of Philadelphia, is an excellent article, both as to quality and colours; but its appearance is somewhat injured by the numerous small fibres of the filling which protrude above the surface of the worsted.

In the several kinds of hearth rugs, much improvement is manifest, and though all the specimens are very creditable to the makers, the committee are constrained to refer particularly to the two tufted rugs (sent after the specified hour,) from the manufactory of Mr. Isaac Macauley, as being far superior to the others, and equal to any of foreign manufacture.

The ten pieces of oil cloth, No. 505, made by Mr. Geo. Uhler, and

the four pieces, No. 318, made by Mr. Isaac Macauley, both of Philadelphia, are considered very superior to the imported article; and the committee would also recommend, as entitled to honourable notice, the four pieces of floor oil cloth, No. 429, made by Messrs. Wiley & Cooper of Brooklyn, L. I.; which, while equal in quality to any now or heretofore exhibited, are superior in style, and have a closer resemblance to Brussels carpeting.

All which is respectfully submitted.

L. Mifflin,
David Lapsley, jr.
Wm. Christie,
} *Committee.*

Report of the Committee of Judges on Straw Bonnets.

The committee of judges appointed to examine the manufactures of straw goods, Report:

That they have given due attention to the articles exhibited. They regret that the name of the manufacturer of the straw in the bonnets No. 375, has not been made known. We recommend the three bonnets to the attention of the Institute, as being very superior in quality, and made with great neatness.

The Leghorn plat bonnet, No. 491, with the piece of braid No. 492, of the same quality with the bonnet, does credit to the manufacturers; much taste has been displayed in the making up of this bonnet.

They understand that the bonnet No. 441, by the children of the Deaf and Dumb Asylum, has been manufactured from the raw material, and by them made in its beautiful form; if such be the case, we would call your attention to this specimen; we trust the makers will meet with encouragement.

The two bonnets, No. 116, from the Shakers' establishment, are of excellent material, and demand our praise.

Geo. W. M'Clelland,
Wm. E. Whelan,
P. Penn Gaskill.

Philadelphia, October 5th, 1833.

Report of the Committee of Judges of Iron and Steel Articles.

The committee report that they have had under examination, blistered steel made by James Rowland, which upon trial, was found to be decidedly inferior to good English blistered steel, and also to specimens exhibited by the same maker on former occasions.

Iron from Lancaster county, deposited by James Rowland, of good quality, and handsomely hammered.

Rolled iron, from the Cumberland Works, Tennessee; a good arti-

cle, and one which will fully compare with the English chain cable iron, both for strength and ductility.

JOHN AGNEW,
RUFUS TYLER,

Report of the Committee of Judges of Musical Instruments.

The committee beg leave to present the following Report:

There were but three instruments (piano fortes) coming under the specification for the medal offered by the Institute, viz. —

A square piano forte, No. 529, Thomas Loud, maker.
Do. Do. No. 204, Nunns, Clarke & Co., makers.
An upright piano forte, No. 530, Loud & Brothers, makers.

All three being made of wood "*the growth of the United States.*" Giving their preference in the first place to square pianos, in general, the choice was confined to the first two named; and, after a minute examination, they agreed, that the one made by Mr. Thomas Loud, was the better instrument of the two. It is, however, due to Messrs. Nunns, Clarke & Co., to state, that the points of difference between their instrument, and that of Mr. Loud, were so trifling that they found great difficulty in coming to a decision.

They further beg leave to state, that the best piano forte presented at the exhibition, without reference to exterior, was No. 528, a square piano forte, manufactured by Mr. E. N. Scherr, but they would also observe, that the treble part of this instrument was three stringed, which gave it an advantage that, perhaps, it would not otherwise have possessed over No. 193, a mahogany square piano forte, made by Messrs. Nunns, Clarke & Co.; this last named, being itself much superior to their first mentioned one of American wood. The committee cannot pass over two upright piano fortes of great merit, one made by B. & W. Nunns, No. 568, which they consider one of the best of the kind for its sweetness and purity of tone, that has ever come under their notice; the other, No. 530, above mentioned, made by Loud & Brothers, for its good tone, and truly tasteful and splendid exterior, the case being made entirely of American bird's eye maple.

A square piano, No. 194, made by A. Babcock, of rose wood, for good tone and handsome exterior, and another, No. 282, made by C. F. L. Albrecht, met the favourable notice of the committee.

They also thought worthy of notice, a piano made by Mr. C. Meyer, with a shifting movement, by which the keys can be raised a semitone; this, although not a new invention, may have merit from the manner in which it is applied. An iron framed square piano was also remarked as having good qualities.

For the sake of preserving in musical instruments, piano fortes especially, a simplicity of exterior which the committee deem essential to beauty, they take the liberty of observing, that there were *some* instruments at the exhibition, whose bad taste and extravagant style

of decoration, produced in their minds only a feeling of regret that so much excellent matter was wasted!

In concluding their report, the committee beg leave to suggest to the committee on premiums and exhibitions, that in their future offers of premiums for piano fortes, they should expressly state the class or kind of instrument, the number of strings, whether a grand, or square, or upright piano; the want of such a distinction renders the duties of this committee extremely difficult, as it is scarcely possible to institute a just comparison between instruments of different grades.

All which is respectfully submitted.

WILLIAM NORRIS,
J. C. B. STANDBRIDGE,
BENJ. CROSS,
W. H. W. DARLEY,
HENRY J. BOLLER.

October 7th, 1833.

AMERICAN PATENTS.

LIST OF AMERICAN PATENTS WHICH ISSUED IN JULY, 1833.

With Remarks and Exemplifications, by the Editor.

1. For *Discoveries in Natural Philosophy, reduced to practice*, made by Horatio Gates Spafford, late of Lansingburg, Renselaer county, New York, deceased. Granted in pursuance of a special act of Congress, passed July 3, 1832. Issued to his relict and administratrix, July 5.

(Some remarks on this patent will appear in the next number.)

2, For an improvement in the *Truss for Varicocele;* Amos Hull, city of New York, July 5.

The patentee, after describing the nature of varicocele, and the precautions necessary in the application of a truss to that disease, insists very particularly on the importance of giving to the pad of the truss that particular degree of inclination which may be most suitable to the state and feelings of the patient. The method recommended for effecting this, is to be used in connexion with the truss patented by Dr. Hull several years since, and reissued under an amended specification, August 17th, 1831. The contrivance which is the subject of the present patent, consists of a circular button turning upon a pivot, and varying in thickness by a regular ascent; its flat sides being inclined to each other. The edge of this wedge-formed button, lies under that through which the spring passes, in the former truss; by turning it round it cants the pad, in any degree which may be required. The same kind of fixtures may, it is said, be applied to other species of hernia, when a similar variation in the pad is desired. This appears to be a simple, and sufficiently good method of canting the pad. Various other modes have been devised for producing the

same effect, and we are not aware that the one here proposed possesses any special advantages.

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3. For a *method of impeding Carriages when descending hills;* Gorham Bunker, Truxton, Courtland county, New York, July 5.

This is a trifling contrivance, very inferior to several brakes which are in use, and which can be made to operate with a graduated force. A lever is placed on the frame of the carriage over the fore axle, which when drawn forward by the driver, moves a system of jointed levers, the last of which terminates in a hook which will catch against one of the spokes, and impede the carriage. Should the horses be running, and this piece be passed in between the spokes, there will be something more than mere impeding; the spokes must break, or the hook be bent. The claim is to "the before described method of stopping or impeding carriages." It might be added, *or of breaking wheels.*

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4. For a *Machine for Cutting Meat, Fruit, &c. into small pieces;* Joseph Buffington, Chester county, Pennsylvania, July 5.

A circular trough, having the general form of a tub, is made to receive the articles to be cut; a vertical shaft passes through its centre, upon which it is free to revolve. The cutting knives, are round plates or disks, fixed upon a horizontal shaft, which is to be turned by a winch; the disks decrease in size as they approach the centre, and the bottom of the tub rises so as to be adapted to them; this decrease in size is proportioned to the decreased circumference of the part in which they are to work. A piece of metal, with slots in it, is placed so that the knives pass through the slots, and are thus cleaned from the adhering matter. Instead of allowing the tub to revolve, it is stated that the cutting knives and frame may themselves revolve round in the tub, or trough.

The claim is to "the above described cutting knives in the form of disks, gradually diminishing in size, revolving within the tub or vessel, in which the substance to be cut is placed; and where the tub, or vessel is required to revolve, causing it to be done by the friction of the cutting knives, on the inclined bottom of the tub."

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5. For a *Press for Cotton, or other fibrous articles;* Henry L. Conner, Natchez, Mississippi, July 5.

This press is intended to operate upon two bales at the same time, the frame being made sufficiently wide for that purpose, and the whole form of the instrument being such as to cause its power to be best applied in that way.

The pressure is made by causing an endless screw to revolve vertically. This screw is of considerable length, and is fixed in the centre of the frame work of the press, so that horses, or other power, may be applied to the lever by which it is turned. A stout nut is adapted

to the screw, and rises or falls as it revolves, serving, by means of jointed levers, operating on the principle of the toggle joint, to act upon a follower. The follower is a long beam, the ends of which work in grooves in the cheeks of the press, which are at sufficient distance, on each side, from the screw, to act upon a bale of cotton placed between it and the bed. The levers which act upon the bed, are, on each side of the nut, two in number, and they may be of equal length: they are connected to each other by a hinge joint; one of them also is united to the nut, and the other to the upper beam of the press in the same way. When the nut is down upon the follower, one of the levers lies upon it, and the other against the cheek of the press; consequently, they are then at right angles with each other. To cause the jointed part to slide readily over the follower, friction rollers are employed.

A drawing would be requisite to give a clear idea of the construction of this press, which, from an inspection of the drawing and model, we thought likely to answer its intended purpose in a satisfactory manner; and we have recently, also, heard a very favourable account of its operation. It is said that with the power of one small horse 34 bales were pressed in a day, two bales being pressed at a time, so closely that 530 lbs. was contained in two feet square. Twelve bales a day is said to be fair work with the ordinary double screw press.

We apprehend that a large portion of the advantage derived from this press results from the toggle joint action. At first the cotton opposes scarcely any resistance, and the follower may then descend rapidly, which it will do by the action of the levers, whilst at the period when the greatest power is wanted, their descent is proportionally slow. There are some other presses for the same purpose, which operate upon the toggle joint principle, but whether so arranged as to produce an equally good practical result, we are not informed.

The claim is to "the manner in which the endless screw is made to operate upon the follower beam through the intervention of the nut and compound levers."

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6. For a *Reversing Side Hill Plough;* Calvin Delano, Livermore, Oxford county, Maine, July 5.

This hill side plough is made with two shares, and one mould board. The beam and handles are made to shift, as the plough is to be turned over at the end of every furrow, that the share which was upwards may enter the ground.

The manner of fixing and bracing the different parts is particularly described, but there is no claim made, the patentee supposing, probably, that the plan is altogether new; in this, however, he is entirely mistaken, as there have been hill side ploughs previously patented in which the same general principle was adopted; the present patentee ought, therefore, to have confined himself to the claiming his own particular arrangement of the parts; and it may be doubted whether even here, he would have found sufficient solid ground for his plough to stand upon.

7. For a Machine for *making Axes, Hoes, Scythes, Pitch forks,* and other agricultural implements; Luther Olds, Oneonta, Otsego county, New York, July 9.

A flatting mill of the common construction is described and represented in the drawings, excepting that the rollers are to have such indentations made in them as shall correspond with the nature of the article to be formed in them. There, however, is no information given respecting the necessary manipulation, and we are well convinced that had the patentee attempted this, he would have been much puzzled in instructing us how to roll out scythes and pitch forks in such rollers. He claims "the before described machine for making axes, hoes, scythes, pitch forks, and other agricultural implements; particularly the apparatus for bending the *poals*, or side pieces of the axe."

The machine *particularly* claimed, consists of two hinged levers, between which the *poal*, or head, of the axe, and its open sides, as delivered from the rollers, is laid to be bent so as to form the eye, and prepare it for welding the steel. When these levers are drawn up they bend the two sides together over a bar which occupies the place of the eye. The iron, we suppose, is to be made red hot, as the levers are to be drawn up by passing over pulleys.

Among the rollers represented in the drawings is one for making spoons, which we thus learn is an agricultural instrument; that is, we suppose, when used for eating hominy, or mush. At all events, rollers for manufacturing such agricultural instruments as spoons, have been known to us for forty years, and they have been several times patented. Rollers for forging a great variety of other articles have likewise been invented, reinvented, and abandoned many times over. In our last volume, p. 410, we gave an account of one for making axes in this way, and then referred to the previous patent of Mr. Asa Collins, for the same purpose..

What is meant by claiming several things generally, and then claiming one *particularly*, we do not understand; things are either new or old, claimed or not claimed; there can be no half way between these points.

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8. For a *Machine for making Cotton Wadding;* John Park and William Peck, Westmoreland, Oneida county, New York, July 10.

We are not familiar with the ordinary mode of making wadding, and cannot therefore compare the process as performed by this machine with that heretofore followed. As regards the machine itself, judging from the drawing, it appears to be well arranged, and calculated to perform the business with facility Its operation is as follows:

A lap is taken from the lap roller of a cotton carding machine, and passed between drawing rollers, in which the speed of the second pair is double that of the first. From the drawing rollers it passes between sizing rollers, which are made either of metal or stone, and extend across the whole width of the frame of the machine. The size is contained in a tub below, and is pumped up into the sizing trough, by a small

pump worked by the machinery. From the sizing troughs it is spread evenly on the rollers, and, of course, on the cotton passing between them; the sized lap then passes over conveying rollers, in a horizontal direction, where it is subjected to the action of revolving fans, similar to those used on the common dressing frame. The sheet of wadding is then conducted upwards, and returned horizontally to the front of the machine whence it descends forming a regular pile.

The claim is to "the applying and proportioning the above described machinery generally; and especially the passing the cotton between the drawing and sizing rollers in such a manner as to make a continued sheet, which is sized and dried by the operation of the same machine."

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9. For a machine for *Making Plugs and Trunnels for Ship Building;* Jesse Reed, Marshfield, Plymouth county, Massachusetts, July 22.

What are in the above title, called trunnels, are more properly treenails, which are the long wooden pins, generally of locust, used in ship building. The machine intended to be described is to be used for the rounding of these, and for the making of round plugs. The specification is not deficient in length, nor, apparently, in the attempt to afford a full description of the machinery, but we have rarely witnessed the bestowal of labour with less good effect. A drawing, with written references, does not suffice to amend the deficiences of the specification, and although we know something of machinery, and could construct one for making treenails and plugs, we should derive but little aid from the account of that before us, however much we might be inclined so to do. After this it will not be expected that we shall attempt to describe the thing; we however will give the claim.

"Your petitioner claims the general construction of said machine above described, and its application to the making of plugs and trunnels for ship building, and rollers and rounds for ploughs; excepting a tool now in use for rounding trunnels."

This exception is about as puzzling as the description itself.

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10. For an improvement in the *Cotton Gin;* James Lynch, Tuscaloosa, Alabama, July 22.

In this gin it is proposed to run more than one cylinder of saws, or pickers, similar to those used by Whitney, the number preferred being three, which are all to be cleared by one cylindrical brush, of the usual construction. The breast, or bars through which the saws work, are, in preference, made of one piece of metal, with slits cut therein; they, however, may be formed of separate bars, rivetted or otherwise joined, together. The patentee claims "the discovery that a plurality of cylinders are preferable to one cylinder, as heretofore adopted, in the picking of cotton." He also claims "the making of Cotton Gin Breasts of any form, if cast, or manufactured of one piece of metal;" and likewise "the manner of causing a band to embrace a whirl sufficiently far round to prevent the danger of slipping." We think that if the two former claims are valid, this last, taken into their company, will endanger their standing in society.

11. For a *Safety Harness;* George Rogers, city of Baltimore, Maryland, July 22.

The object of this invention is to disengage a horse, or horses, from a carriage, by loosening the harness, and allowing their escape freely therefrom; this is effected by drawing out spring keys which pass through staples, and by this means, separating the harness and the belly band. Lines lead from these spring keys to the inside of the carriage. The two parts of the harness are, at top, connected by a link, one end of which passes through a ring in the upper end of the hame, and is confined there by a spring bolt passing through a hole, or mortise; the belly band has a similar connexion. The things claimed are "the key at the end of the hame, or link of the hame; the collar cap fastened to the collar; the pad terets; the belly band made in two parts, connected together by the staple and spring key, and the mode of loosening or separating it in the centre; also the link."

Some of the parts mentioned in the claim are merely auxiliary to the general plan.

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12. For *Machinery for working of Churns;* Philo B. Pratt, Kent, Litchfield county, Connecticut, July 22.

A lever beam is to be made to work on its centre, and from each end of it is to descend a rod or pitman, attached to a crank shaft, which operates upon the dashers of churns, one being placed at each end, under the beam. A wheel and pinion, turned by a crank, are to give an accelerated motion.

This is very similar to an apparatus for the same purpose patented some time since; but not deeming either of them of sufficient importance to compare them together, we shall not undertake the task of looking at our index for the date ot the former, but leave it to those who feel some interest in the affair.

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13. For a *Rotary Steam Engine;* Edmund Perry, and Isaac N. Crosby, Rochester, Monroe county, New York, July 22.

The patentees call this "a concentric, or revolving steam engine;" and they have described and figured one of a kind which is found most numerously in books, and in the patent offices of Europe and of this country. Valves, four in number, are to shut in upon a cylinder, so as, when closed, to make a part of its periphery. This cylinder is to revolve within another, having heads, and two stops, or cams within it, on opposite sides, which close the valves "*approaching near enough to the inner revolving cylinder to prevent the escape of steam between them,*" which must be *pretty near.* The only thing about this engine which we do not now recollect to have before seen is the placing of springs under the valves to give them a tendency to rise; and the admitting of steam through holes beneath them, to increase this tendency. These parts, however, are not claimed as improvements, the whole apparatus being described, and the whole therefore, patented. If the machine was likely to answer any good purpose, the patentees might amend their specification in this particular, but as the improve-

ments will have no tendency whatever to remove the real objections to the original instrument, to induce them to do so would not be to place them in a situation to obtain value for value.

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14. For an improvement in the *Surveyor's Compass*, Julius Hanks, Troy, Renssellaer county, New York, July 22.

The sights in this circumferentor, instead of rising vertically in the usual way, are in the form of a vertical circle, furnished with slots and holes which enable the surveyor to take in elevations and depressions which cannot be sighted by the ordinary instrument. It has, sometimes, a movable limb, concentric with the vertical circle, for taking the degrees and minutes of altitude and depression; and the needle has a Vernier attached to its point, by which the surveyor can read off minutes without touching the compass. These improvements enable it to answer most of the purposes of the compass, the quadrant, and the levelling instrument.

The improvements claimed are "The circular band with the openings therein for sight and object; with the right as respects form and principle and manner of construction, of applying the same to the surveyor's compass, and all others to which the improvements may be applicable.

"The use and application of the beam as connected with bands of the foregoing description, with its fixtures and appendages, including the right of connecting an index or Nonius to either end, and a telescope.

"The use and application of a graduated scale upon the band.

"The semi-cylindric form of the cross, or covers, to the spirit levels, as herein applied to compasses of this description, as well as the manner of making them."

"And also the right, as to form or principle, of applying the Nonius to the magnetic needle, together with the sliding balance to effect and preserve the equilibrium of such needle, and all others to which it is applied."

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15. For a *Galvanic Instrument for the Cure of Diseases;* Daniel Harrington, city of Philadelphia, July 22.

(See specification.)

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16. For an *Apparatus for Straightening Clump Feet;* Gideon Goodrich, Portland Harbour, Chataque county, New York, July 22.

The apparatus here patented was contrived by the patentee to remove the distortion in the feet of one of his own children, and having found it to answer the intended purpose, he has made it the subject of a patent. The well read surgeon is aware that this complaint has been fully investigated, and that the distortion yields readily to the means of reduction which have been devised, and which appear to be scarcely susceptible of improvement. To the late eminent Professor Scarpa, of Italy, we are indebted for our accurate knowledge upon

this subject, who also devised the apparatus which, with some slight improvements, is employed by the surgeon for its cure; these facts, however, were unknown to the present inventor, and all that he has done, therefore, if not new, is so far original. The description of his apparatus refers throughout to the drawings of it, and could not be understood without them. The claim made is to the general arrangement which he has adopted; this manifests considerable ingenuity, and will probably be useful in cases and situations where a competent practitioner of surgery may not be found.

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17. For *Improvements in the Piano Forte;* Louis Fissore, an alien, who has resided two years in the United States, Baltimore, Maryland, July 22.

The improvements here patented depend principally upon the employment of cast iron to constitute a part of the frame of the instrument, the novelty in this part not consisting in the use of this material, but in the particular manner of its construction and adaptation. The turning pins are passed through a cast iron plate, and are fixed in such a way as not to depend for their tightness upon being driven in, but upon a washer passing over a square shank at the back of the plate, the pin being drawn up to a shoulder by means of a screw nut. A particular kind of tuning hammer is also employed, the key part of which is acted upon by pinions, which give to it a very slow, and consequently a powerful motion, from that of the handle.

The claims are to the manner of constructing and connecting the iron frame; the manner of fixing the tuning pins; and to the instrument for tuning, operated upon by a toothed wheel and pinions.

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18. For a machine for *Making Cordage;* John Drummond, Brooklyn, New York, July 22.

This apparatus is for doubling, twisting, and laying cordage, of various descriptions. A main shaft is to revolve, horizontally, and this carries three other shafts, parallel to itself, and sustained upon arms projecting from it. Upon these shafts are to be placed the bobbins containing the yarn. A gearing of wheel work, gives motion to the main shaft, by which the laying is effected, and also to the secondary shaft, by which the yarns are doubled and twisted. The cords are delivered through holes in the centres of the respective shafts, and the whole thus effected at one operation.

A specification for a similar machine invented by a gentleman in Philadelphia,was prepared by the Editor about seven years since,with a view to its being patented both in this country and in England; but on sending it over to the latter country, it was found that a machine operating upon the same principle was in use in the Kings rope walks at Woolwich, and in other places; the design of obtaining a patent was therefore abandoned. The resemblance between these two machines is very striking, they do not, in fact, differ in any essential feature. The same plan, as we have said, was then known in England,

and it now appears that previously to the time first named, one substantially like it had also been patented in the United States.

The claim in the present instance is to "the combination and arrangement of the several parts; particularly the hollow shafts, and the mode of communicating to them a contrary motion to that of the main shaft in forming the strands, and the mode or laying them in forming the rope," not one of which would stand the test of a critical examination, although it is probable that the patentee has truly invented all that he claims.

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19. For an improvement in the manner of *Constructing Flat Boats and Arks;* Thomas Symington, city of Baltimore, July 22.

The object in view in the above named invention is to construct boats so that they may serve the purposes of the common arks which descend rivers, and lessen the risk and avoid the loss which are sustained by the sale of the lumber after the boat is taken to pieces at its place of destination; the common ark being built of timber which is unsaleable. The means adopted consist, in part, in the addition of a temporary deck, and in a new method of attaching the boats, or arks, to each other. They are to be from sixteen to thirty feet long, and from sixteen to twenty feet wide; the sides from one to three feet high, and made of timber suitable for joist, one, two, three, or more pieces being used edgewise. The bottom is to consist of boards, or plank, in one or more thicknesses; and they, as well as the deck boards, may have shallow tongues and grooves, formed by suitable machinery. Middle sills and rafters to support the temporary deck are also made of joist stuff. The rafters are to be a little raised above the sides, and the deck plank nailed on in a temporary manner. The ends, which are hinged, are made square, but the forward and hind ends should be sloped, like those of a scow, and the whole so arranged as to injure the timber as little as possible.

Hinges, the construction of which is particularly described, are to be used to connect the boats, or arks, together, and are to be removed to be used with others. These hinges are to be placed midway between the deck and bottom of the boats, which allows them to vibrate by the agitation of the water, when much closer to each other than would be the case if the hinges were near to the top, or to the bottom.

The claim is to the above mode of constructing flat boats, or arks, by placing on them a temporary deck, in the manner described; and to the manner of hinging them at or near the middle of their square ends.

A mode of joining them by saplins, in lieu of hinges, is also described and claimed, and particular directions are given for building and launching them.

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20. For the *Application of an Elastic Spiral Spring to the Traces, Swingle Trees, or Shafts of Carriages,* to aid in overcoming the vis inertia of the load of carriages when starting; John Sherfy, Union Town, Frederick county, Maryland, July 22.

Some years ago, spiral springs were applied to the rigging of vessels for the purpose of easing off the sails when struck by sudden flaws of wind; it is to be presumed, however, that the advantages anticipated were not realized, or not to such an extent as to compensate for the additional complexity and expense, as we have never seen them in use. The springs proposed by the present patentee, are similarly constructed and applied. The spiral spring is wound with the coil open, and has a centre pin running through it, precisely like what has been called, though improperly, the spiral spring steelyard. So far as the theory of the action of the spring presents itself, it appears calculated to be beneficial when applied to harness, but we are apprehensive that the extra expense, and the liability of the springs to break, will prevent a general adoption of the plan.

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21. For a *New Musical Instrument, called the Plettro Lyra;* Phil. Trajetta, city of Philadelphia, July 22.

The instrument represented in the drawing has the general form of a violin, or viol, and has a foot by means of which it may stand vertically, the foot resting on the floor. The instrument is to be made of various sizes, five different ones being proposed, extending from that of the violin, or small size, to that of the contra basso. The inventor says that one great object of the invention was to provide an instrument to be played with the bow, and which should yet be free from those objections which exist to the violin in the hands of females, from the awkward manner in which it is intended to be held. With the Plettro Lyra, it is said, female performers may accompany and support their voices in a choir, upon a stringed instrument capable of producing long sounds, with their modifications of force. The instrument is easy to tune, and may be used for leading with all the advantages of the violin, and is, from the manner of holding it, more congenial to the dignity of the place of performance than that of the violin, even in the hands of male performers.

The strings pass over a bridge, the distance of which from the nut is short, in comparison with the body of the instrument. For larger strings this distance must be proportionably increased, and its pitch may thus be brought to that of the bass, or double bass.

"The application of short strings to a large sounding board, by inserting them in it, or suspending them over it, and giving to them a smaller relative distance from the bridge to the nut, which makes a large stringed instrument produce the high pitch of the violin, a much fuller sound, and of the kind required to perform the principal part in music," is claimed as constituting the invention.

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22. For an improvement in the *Cotton Picker and Lap Machine;* Jesse Whitehead, Godwinsville, Bergen county, New Jersey, July 22.

The improvement here patented appears to consist entirely in the application of a wheel of about thirteen inches in diameter upon the end of the lower back lap roller of a picker. The advantage derived

is said to be in the greater length of leverage to which the moving power of the gearing is applied. The wheels heretofore employed, it is said, were not larger than the rollers on the axes of which they were placed, and that they consequently worked to a great disadvantage.

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23. For an improvement in the *Stomach Pump, Cupping Instrument, and Breast Pump;* Lemuel B. White, city of New York, July 22.

We described an improvement in the injecting syringe, at p. 321 of the last volume, and the apparatus above patented appears to be much like the one there noticed, a syringe being substituted for the caoutchouc bottle. In the present instance the description is extremely meagre; the novelties are not pointed out, and there is no claim.

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24. For a mode of *Preventing the emission of Sparks from the Chimney of Locomotives or other Steam Engines;* Edward A. G. Young, New Castle; New Castle county, Delaware, July 22.

The main flue is to be covered with fine wire gauze, and there are to be four, or any other number of, additional flues, which may proceed from the upper part of the main flue, and be elbowed so as to have their mouths upwards; these also are to be covered with wire gauze, allowing the smoke to pass, and detaining the sparks.

The foregoing is an epitome of the specification of this patent, which does not make any direct claim whatever, although it may be inferred that the thing intended to be patented is the application of the wire gauze covering. The patent obtained by Mr. Espy, on the 29th of June, and published in our last number, vol. xii. p. 418, includes the use of the wove wire, in addition to a mode of increasing the draft, which appears to be absolutely necessary to compensate for the obstruction presented by the application of this reticulated material.

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25. For a *Thrashing Machine;* Benjamin Hinckley, Fayette, Kennebeck county, Maine, July 23.

This is a cylinder and concave machine, the concave being made of sheet iron, and punched with holes so as to form a grater; it rests upon wooden supports, and is borne up by springs.

The claim is to "the grater apron, resting upon springs, and applied to the cylinder in the manner described. The form and disposition of the teeth in the cylinder, and the comb, or clearer, to carry off the straw."

The teeth in the cylinder are to be of wire, about one-eighth of an inch in diameter, to project out about one-fourth of an inch, and to be one-half an inch apart; this constitutes "their form and disposition." The *comb* is a revolving piece of wood, two inches square, having teeth in it like rake teeth.

26. For a *Washing Machine;* Benjamin Hinkley, Fayette, Kennebeck county, Maine, July 28.

Three wooden rollers, having their axes parallel to each other, are to be fixed across a trough. The middle cylinder, round which the clothes are to be wound, is to be ten inches in diameter, and to be turned by a crank; the others, four inches in diameter, are to be pressed up against the middle cylinder; the crank is to be turned alternately back and forth: The claim is to these cylinders lying horizontally.

If the claim in this and the preceding patent should be found to stand the test of a fair investigation, we are no judge of likenesses; to us it appears that the things claimed resemble so closely what has been already placed in a similar predicament, as to require very nice eye to discriminate between them.

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27. For a *Plough;* Lewis Donnell, Jefferson, Richland county, Ohio, July 23.

There is but little to make known in this plough, the difference between it and others, if any, consisting in "the form of the mouldboard, the coulter, the inclination of the neck, and the manner of confining the mouldboard to the beam," these being the things claimed; but they do not appear to possess that distinctive character by which this plough can be recognized in the crowd of those deposited in the patent office.

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28. For *Portable Mead;* Jonas C. Brigham, Methuen, Essex county, Massachusetts, July 25.

This article is called portable mead, portable sarsaparilla mead, or portable chickerberry mead, according to the kind of article used to flavour it. Two pounds of honey, and two of sugar, or four of either, or eight of molasses, six ounces of tartaric, or some other acid, two drachms of essence of sarsaparilla, or any other essence preferred, two ounces of wheat flour, two ounces of cream of tartar, two drachms of salt, and water enough to make up a gallon, are to be incorporated together. When used, about two table-spoonsful of this sirop are to be put into a tumbler, which is then to be two-thirds filled with water; when on stirring in one third of a tea-spoonsful of soda powder, fermentation will take place. It is then, we suppose, to be drank; the directions, however, do not extend to this point.

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29. For *Glazing or Preparing Pelisse Wadding;* Stakeley Turner, Providence, Rhode Island, July 25.

The apparatus described in the specification is to be made of considerable length, and the fleece of cotton is to be glazed on its two sides at the two ends of the machine, which should be several yards apart. The carding machine should be in a story below that of the glazing machine, and is to deliver the fleece to be glazed, on to an endless apron, which carries it in a sloping direction up to the glazing machine;

when it arrives at one end of this it passes over a roller covered with lead, and about 15 inches diameter, which is kept revolving in a trough containing the glazing liquor, say gum water, or size. There are two small rollers 3 inches and a half in diameter, which press the fleece on to the glazing roller. From these it passes up on to another endless apron, revolving horizontally, and carrying it to the opposite end of the machine; the glazed side being upwards, and the air of the room warm and dry, the glazing is sufficiently dried in its passage, and is ready to have its reverse side glazed in a similar way, by a second trough and rollers. From these it passes on to a third revolving apron, above the latter, to the end of the machine where it received its first glazing, and where it is wound upon a suitable roller, The gearing must be such as will give the proper velocity to the respective parts.

There is no claim made, which, if the general arrangement is new, may not be a thing of importance; if otherwise, however, it might prove to be a fatal defect.

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30. For a *Machine for Manufacturing Shoes;* Solomon Gerhard, and Joseph Vanneman, Camden, New Jersey, July 26.

The machinery described in the specification of this patent is intended to enable the workman to preserve a standing or upright posture. It is ingeniously contrived and arranged, bearing in some of its parts, a considerable resemblance to apparatus for a similar purpose for which a premium was given in England, many years ago, by the Society for the encouragement of Arts, Manufactures and Commerce, although differing therefrom in its details. This machinery, though highly spoken of at the time of its invention, has never gone into use; which may be accounted for from the strong prejudices and confirmed habits of the artisans; but, possibly, experience may have suggested some other objections of which we have not heard.

The patentees, in the present case, after fully describing their machine, say "We do not claim to be the inventors of the ratchet wheels, ball and socket, clamp, or many other things which we have mentioned; but we do claim the general combination and arrangement of the various parts, for the purpose of manufacturing shoes and boots; we also claim the use of the cork for the purposes set forth, and the particular manner of opening and closing the clamp by means of a lever and inclined plane, instead of a screw and nut."

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31. For an improvement on the *Hemp and Flax Cleaner and Hackler;* Arnold Zellner, Pulaski, Giles county, Tennessee, July 26.

The machine upon which this is an improvement was patented by Mr. Zellner, on the 25th of October, 1832, and is described at p. 240. of vol. xi. The patentee states that his improvement in the cleaning part "consists in an alteration of the flue which received the tow and discharged the dust outside of the house, as specified in the original: which alteration is as follows:

"The flue rises in the same place as in the original, and takes a

curvilinear turn backwards, and discharges the tow into a closed room behind the machine. The improvement relates also to the hackling part. The hackle is cylindrical, and operates by revolving on its axle. There is a pair of fluted rollers between which the tow is passed in applying it to the hackle, which are denominated the feeding rollers. They may be made by fixing bars of iron in a base of wood, with an iron axle through the wood for the rollers to turn on; but the better way to make them is of metal, the rollers being cast iron with wrought iron axles. About two feet in diameter, and eighteen inches in length will be a good size for the hackle; the rollers may be about three inches in diameter and of about the same length with the hackle. The gearing is to be such as will move the hackle comparatively swiftly, and the feeding rollers comparatively slow. The teeth in the hackle are to be fixed into the cylinder, much inclined from a perpendicular, so that when the hackle revolves on its axle, the teeth move considerably with their points foremost."

There are directions given for the manipulating with this machine, which we omit, as they would be imperfectly understood without the drawing. The information which we have received respecting the actual use of this apparatus is very favourable, giving us good reason to believe that its operation is much superior to that of most of the machines which have been constructed for a similar purpose.

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32. For a *Mode of Applying Steam Power;* Elisha Bates, Mount Pleasant, Jefferson county, Ohio, July 27.

This patent is taken for a *new principle* of which we are told that modes of the applications are various and numerous. "It is the application of the power of steam from a cylinder and its necessary appendages and fixtures, to a *wheel*, instead of a *crank*." Several of the various modes of application are given in the specification, and one of them is represented in the drawing. In this, the piston carries a rod furnished with cogs on both sides of it, each side taking into a cog wheel, having rachet wheels so geared to it that they may carry a fly wheel in the same direction by the up and the down stroke of the piston. To the experienced machinist, we need say no more to convince him of the antiquity and inutility of the whole affair. We could fill many pages with what we know of similar attempts; but those who do not read would not buy it, and those who do have no need of it. For ourselves we seek no further to ascertain the utility of an *improvement* in the reciprocating engine, after we learn that it is intended to dispense with the crank motion; a motion upon which its useful operation is almost entirely dependent.

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33. For an improvement in the *Cotton and Wool Carding Machine;* David Adams, Richmond, Henrico county, Virginia, July 29.

The invention here claimed is the application of a second doffing cylinder to the carding machine, by which, it is said, one half more work can be done, than by a single doffing cylinder; that the work is better done, and with but little additional application of power. The single doffing cylinder, it is remarked, does not clear the main cylinder sufficiently, but leaves it much clogged with the carded fibre. The whole claim consists in the application of this second cylinder, with the requisite gearing to put it in action.

How many patents have been taken for using two doffing cylinders, we cannot say, nor is it necessary to take the trouble to ascertain it, one being as effectual as twenty, in proving that the thing is not new. We, however, could refer to four or five, one of which was patented in 1810. We had supposed the use of them to be known to every man extensively engaged in carding and spinning, and particularly to those in the woollen business. In the specification before us, cotton and wool are both mentioned, but we have heard that it was the design of the patentee to confine himself to its application in the cotton carding machine, under an idea that this new application, as he supposed it to be, would enable him to sustain a claim to a patent. This, however, cannot be done; it having been decided in court that the application of an old machine to a new purpose, is not a proper subject for a patent.

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34. For a *Mortising Machine;* Asaph Whitmarsh, East Bridgewater, Plymouth county, Massachusetts, July 30.

We shall not attempt to describe this machine with any minuteness, as a drawing would be necessary to the understanding of it. The claim made is to "the gaining or progressive motion of the chisels, and also the use of two chisels on one slider." The slider upon which the two chisels are placed works horizontally backward and forward in a suitable frame, being operated upon by a crank on a shaft with a fly wheel. The stuff to be morticed is held in a box, between the two chisels which point towards each other; there being suitable contrivances for gauging, or adapting the box to the stuff to be mortised.

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35. For an *Improved Hydrant;* Thomas W. Newton and Joseph H. Laning, city of Philadelphia, July 30.

(The specification will appear in the next number.)

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36. For a new mode of *Cleaning Wheat or other Grain;* Samuel Ellicott, Nathaniel N. Ellicott, and William Ellicott, of Ellicott's Mills, Baltimore county, Maryland, July 31.

A bed stone is made, which is surrounded by a rim of the same material, giving to it a dished, or pan-like form, the edges of the rim sloping outwards. A runner is fixed upon a spindle in the usual way, its lower side being in the form of a truncated cone, adapted for the bed stone; the runner may be raised to

any required height above the bed stone, and the grain, fed through the eye, is to be rubbed between the stones, and discharged through a hole near the bottom of the lower stone.

The claim is to "the before described modes of rubbing or cleaning grain, particularly the rim on the bed stone, to retain the grain to be submitted to the requisite degree of friction or pressure.

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37. For an improvement in the *Cap used as a Substitute for Flyers;* in what is called Danforth's filling frame; Joseph Ripka, Manayunk, Philadelphia county, Pennsylvania, July 31.

(See specification.)

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38. For an improvement in the manner of making *Keys for the Extracting of Teeth;* Cornelius Adle, Winthrop, Kennebec county, Maine, July 31.

The patentee claims "the manner of constructing the stem or beam; the manner of constructing the fulcrum, and of attaching it to the stem, and the manner of attaching the hook to the fulcrum;" but, with the exception of the first point, which consists of a bend in the shank, in which there is no novelty, the instrument is so imperfectly described, and the drawing, if drawing it can be called, so defective, that we cannot pretend to decide upon its latent merits. If the drawing with the instrument, is not more successful than the drawing of it, we should prefer the unimproved apparatus whose powers we have often essayed.

SPECIFICATIONS OF AMERICAN PATENTS.

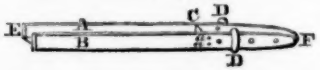
Specification of a patent for a Galvanic Instrument or Apparatus, for the cure of certain diseases in the human system. Granted to DANIEL HARRINGTON, *city of Philadelphia, July* 22, 1833.

To all whom it may concern, be it known, that I, Daniel Harrington, of the city of Philadelphia, in the state of Pennsylvania, have invented a new and useful instrument, or apparatus, for the purpose of applying the galvanic, electric, or magnetic fluid, or influence, as produced by the contact of different metals, to the cure of certain diseases in the human system, and that the following is a full and exact description of the construction of, and the modes of operating with, the said instrument, or apparatus.

Any two different metals which excite the galvanic influence by contact, may be used in the formation of this instrument, but I prefer for this purpose silver and zinc, and shall speak of them only, therefore, in my description. The instrument is intended to be applied to the different external orifices of the human body, as to the anus, the vagina, the nares, and the meatus auditorius, or orifice of the ear, for the removal of obstructions, and the cure or relief of such diseases as may be beneficially treated thereby. The particular instrument

which I am about to describe is of a size and form which adapt it to the rectum, in the adult subject; those used for the nostrils, or other purposes, must, of course, be so varied in form and size as shall be best suited to the purpose, the general principle of their construction being in all cases similar; they must also be suited in size to the age, or other circumstances of the patient.

The accompanying drawing represents the instrument of two-thirds the full size of one which I have had in actual operation; it consists, principally, of two pieces of metal, separated by a bad conductor of electricity. A and B are the two pieces of metal, each made in the

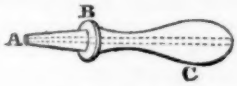


same form; C is a piece of ivory, glass, resin, or any other bad conductor of the electric fluid. D D, are flanches, collars, or projecting plates, of metal, which stand at the distance of about two inches from one, and five from the other, end of the instrument. The nonconducting piece C, may be about one-fourth of an inch thick, and from two to three inches long; its width must be equal to that of the pieces of metal between which it is interposed. The general width of the pieces of metal A and B, is about half an inch, and their greatest thickness is about one-eighth of an inch. The silver should be made much thinner, say one thirteenth of an inch thick, for three or four inches in length, towards the end E, in order that, by its elasticity, the two metals may be readily brought into contact with each other. The end from D to F is to be nicely rounded, and tapered, as it is to be inserted into the rectum, and the faces of the collars, or flanches, towards that end, should be somewhat convex, and perfectly smooth, that it may press, without producing inconvenience, upon the delicate membrane which surrounds the anus. *a a a* are rivets, or pins, of wood, which pass entirely through the two thicknesses of metal, and the nonconductor, to connect them together, cement also being interposed between the metals and the ivory, to promote the same end. Screws of metal may be used for the same purpose, provided they do not pass entirely through the nonconductor.

When this instrument is used, it should be dipped into olive oil, and then inserted by a gently twisting motion, until the flanches bear against the membrane, in which position it is to be held whilst it is in use. In order to produce the desired influence, the silver and zinc are to be alternately pressed together, and suffered to recede; a succession of slight, though perceptible, shocks, will be thus produced, and it will rarely happen that the application of the instrument in this way will not produce a dejection, even in cases where the constipation has been obstinate. Experience has shown that instead of the debilitating effects of ordinary cathartics, this application tends to give tone to the intestinal canal, and in this way to produce very happy results in cases of dyspepsia, habitual costiveness, and other complaints. By keeping the two metals in contact, a continued in-

fluence will be produced, and this, when desired, may be increased by the use of a small galvanic pile, or battery, the poles of which may be connected with the respective metals; for ordinary purposes, this, however, is not necessary.

As an *appendage* to this instrument, when used for operating through the medium of the rectum, I sometimes employ another, which, for an adult, may be in form such as is represented in the



accompanying figure. This appendage may be turned out of ivory or hard wood, or it may be blown out of glass. The end A may be inserted in the same way with the end F, of the first named instrument; the collar, or flanch, B, serving to regulate it in the same way with the metal collar, D. The handle part, C, may be of any convenient form. This appendage I perforate from end to end, as shown by the dotted lines. It will be found convenient, sometimes, to use this as introductory to the galvanic instrument, or, occasionally, after it, or alternating with it. By means of the perforation, a syringe, or injecting pipe, adapted to the larger end of the perforation, may be used to inject oils, or other fluids, which, from a diseased state of the rectum, or from other causes, may be required.

I am aware that galvanic circles have been, and are now, employed in different ways, as by inserting a small cylinder of zinc in the rectum, and a piece of silver in the mouth, with a connecting wire of silver between the two; and also by binding plates of zinc and silver on different and distant parts of the body, after removing the cuticle, and connecting such plates by a wire, as above; thus keeping up a continued action of the galvanic influence, or an action of many hours duration; I do not, therefore, claim the application of such instruments; but what I do claim as my invention is the employment of two metals, with a bad conductor of electricity interposed between them, in the manner, or upon the principle, herein described, for the purpose of producing for a shorter or a longer period, a succession of gentle shocks, for the purpose of removing obstructions, or of producing other beneficial effects, in cases of diseased action, by inserting and using the same as directed, in any of the external orifices of the human body.

DANIEL HARRINGTON.

Specification of a patent for an improvement in the Cap used as a substitute for Flyers in Danforth's Spinning Machine. Granted to JOSEPH RIPKA, *Manayunk, Philadelphia county, July* 31, 1833.

To all whom it may concern, be it known, that I, Joseph Ripka, of Manayunk, in the county of Philadelphia, and state of Pennsylvania, have invented an improvement in the cap used as a substitute

for flyers in what is called Danforth's filling frame, and that the following is a full and exact description thereof.

The cap which I use is made in the same general form as that employed by Danforth, but instead of leaving the outside of the cap of a plain continuous surface, I form thereon three or more beads, fillets, or rings, which rise a sixteenth of an inch, more or less, above the general surface of the cap. When I use three only of such rings, I form one of them on the lower end of the conical cap, another on the upper end, just where it begins to curve in towards the spindle, and the third about two-fifths of the distance between the two former, measuring from the lower edge; the precise situation, however, is not a point of importance.

In the smooth cap, without projecting rims, an attraction, or adhesion, of the thread to the surface of the cap takes place in certain states of the atmosphere, occasioning great difficulty in the spinning, and a frequent breaking of the thread, which evils are obviated by the projecting rims above described.

What I claim as my invention, and for which I ask a patent, is the formation of three or more projecting rims upon the cap used in Danforth's spinning machine, in the manner, and for the purposes herein described.

JOSEPH RIPKA.

A. The cap.
B. Rings, or fillets.

ENGLISH PATENTS.

Specification of a patent granted to GEORGE FREDERICK MUNTZ, *Metal Roller, for an improved manufacture of Bolts, and other, the like, Ship's Fastenings. Dated December* 17, 1832.

To all to whom these presents shall come, &c. &c., now know ye, that, in compliance with the said proviso, I, the said George Frederick Muntz, do hereby declare the nature of my said invention* to consist in making the said bolts, and other, the like, ship's fastenings, of an alloy of zinc and copper, in such proportions, and of such qualities, as while it enables the manufacturer to roll and work the said compound metal into bolts, and other, the like, ship's fastenings at a red heat, and thus makes the said bolts, and other, the like, ship's fastenings, less difficult to work, and, consequently, cheaper to manufacture, renders the said bolts, and other, the like, ship's fastenings, less liable to oxydation, and consequently, more durable than the ordinary bolts, and other, the like, ship's fastenings now in use. And in further compliance with the said proviso, I, the said

* In vol. xii. p. 195, we gave a short notice of the specification by the same patentee, for making plates for sheathing ships. Our readers will perceive that the present patent is for the application of similar materials for making the bolts and fastenings.

George Frederick Muntz, do hereby describe the manner in which my said invention is to be performed, by the following statement thereof, that is to say:

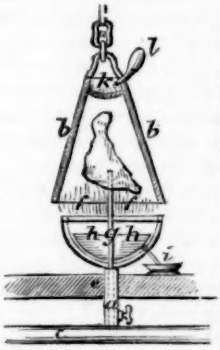
I take that quality of copper known in trade by the appellation of "best selected copper," and that quality of zinc known in England as "foreign zinc," and melt them together in the usual manner in any proportions between fifty per cent. of copper, to fifty per cent. of zinc, and sixty-three per cent. of copper to thirty-seven per cent. of zinc; both of which extremes, and all intermediate proportions, will roll and work at a red heat; but as too large a proportion of copper increases the difficulty of working the metal, and too large a proportion of zinc renders the metal too hard when cold, I prefer the alloy to consist of about sixty per cent. of copper to forty per cent. of zinc: this compound I cast into ingots of any convenient weight, and then heat them to a red heat, and roll or work them while at that heat into bolts, and other, the like ship's fastenings, in the same manner as copper is rolled or worked, but only taking care not to overheat the metal so as to produce fusion, and not to put it through the rollers, or work it, after the heat has left it too much, say when the red heat goes off. Now whereas it is evident, that the said alloy may also be made from a compound of copper and calamine by cementation, taking care that the quantity of calamine shall be such that the zinc extracted from it will be in some of the same proportions to the copper as before mentioned; but as it is very difficult to make the copper take up the necessary quantity of zinc by this process, it is more expensive. It is equally evident that brass of very good quality, with the addition of zinc requisite to make the proper proportions of copper and zinc, will likewise roll and work hot, and answer the purpose, but is again a more expensive mode.

And whereas I claim as my invention, the manufacture of bolts, and other, the like, ship's fastenings, of an alloy of copper and zinc, as aforesaid, in such proportions as will enable the manufacturer to roll or work the said alloy while at a red heat, into bolts, and other, the like, ship's fastenings, which are more durable and more cheaply manufactured than copper bolts, at the same time that they are less liable to corrode; and such my invention being, to the best of my knowledge and belief, entirely new, and never before used within that part of his said Majesty's United Kingdom of Great Britain and Ireland, called England, his said dominion of Wales, or Town of Berwick-upon-Tweed, I do hereby declare this to be my specification of the same, and that I do verily believe that this my said specification doth comply in all respects, fully, and without reserve or disguise, with the proviso in the said hereinbefore in part recited letters patent contained, wherefore I do hereby claim to maintain exclusive right and privilege to my said invention.

[*Rep. Pat. Inv.*

To ROBERT HICKS, *Surgeon, for his invention of certain improvements in Culinary Apparatus. Sealed July* 6 ,1831.

The object of this invention is to roast meat by the heat emitted from the flame of ignited gas, that heat being confined under a conical cover which is placed as a screen above a circular burner, and the meat to be cooked is mounted upon a vertical spit in the centre of a circle of gas flame.



The annexed figure represents one of the apparatus, the gas burner and the conical cover being shown in sections. Several of these apparatus of different sizes are proposed to be adapted to a table or a dresser in a kitchen, and it is deemed most adviseable that the dresser should be placed within a recess, for the purpose of confining the heat, and that a pipe from a hood above should take off the steam, and other vapour, into the kitchen chimney or into the open air.

A chain, *a*, is passed over a pulley above, fixed in the ceiling, if convenient, from one end of which chain the conical cap, or cover, *b*, is suspended, and at the other end of the chain a balance weight is attached.

A pipe, *c*, conducts the ordinary illuminating gas, and from the upper side of this pipe any desired number of branch pipes, as *d*, may lead off.

These branch pipes, furnished with stop cocks, are intended to pass through a dresser or table, as *e*, and above the dresser, the pipe divides into arms, which conduct the gas to the annular burner, *f f*, the burner having perforations cut round its outer rim.

A rod, *g*, is placed perpendicularly in the centre of the burner, upon which a joint of meat, intended to be roasted may be spitted, and a basin, or dish, *h*, is also mounted within the ring to receive the dripping and gravy, which may be allowed to run off through a pipe into a basin *i*.

When the meat to be roasted has been thus spitted, and the gas in the circular burner lighted, the conical cap or cover is then let down over the meat, as shown in the figure, which confines the heat of the flame, and the reflection from the inner surface of the cone roasts the meat in a very equal and perfect manner.

In order to baste the meat without removing the cap or cover, a perforated dish or colander, *k*, is made in the upper part of the cone, into which the fat, or other basting materials, may be introduced by a broad funnel, *l*, extending on the outside of the cone; the dripping for basting being taken by a spoon from the basin, *i*, and poured into the funnel, *l*, as it may be required.

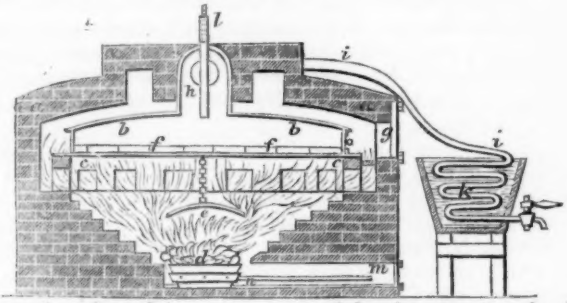
The patentee says, in the conclusion of his specification, I claim as my invention the improvements hereinbefore described, as applied

to culinary purposes, and such my invention being, to the best of my knowledge and belief, entirely new, and never before used, &c.

[*Lond. Jour.*

To ROBERT HICKS, *Surgeon, for his having invented, or found out, an economical apparatus or machine, to be applied in the process of baking, for the purpose of saving materials. Sealed June* 26, 1830.

This invention is stated to consist in the combination of an oven for baking fermented dough into bread, with a conducting pipe and refrigerator or condensor, which shall receive and condense the steam and alcoholic vapour emitted from the bread while baking. There is no peculiar feature of novelty in the form or construction of the oven, excepting that it is proposed to be of iron, and to have an outlet at the top for carrying off the steam and vapour. It is particularly expressed, that the invention applies solely to the baking of *fermented* dough, and not to the baking of other kinds of dough, as biscuits and pastry, which have not been fermented.



The construction of the oven proposed by the patentee, is shown in the annexed section. *a a*, is the brick-work forming the outer casing of the furnace and flues; *b b*, is a close box of iron, of an eliptical shape, which is to constitute the oven. This is supported by the edges of the bottom plate bearing upon the rim of brickwork *c c*.

The fire is not to be placed within the oven, but in the furnace, *d*, below, and the oven is to be heated by the flame and smoke passing upwards from the furnace to the under surface of the bottom plate, and through the apertures in the rim of brickwork, *c*, to the channel round and over the top of the oven, from whence the smoke ultimately escapes by a chimney.

A shield, *e*, is suspended from the bottom plate over the centre of the furnace, in order to prevent the heat of the fire acting with too great a degree of intensity in the middle of the oven. By means of this shield, the heat is more equally distributed over the bottom of the oven.

The bottom of the oven is covered with fire bricks, *f f*, and dough is introduced into the oven, and removed from it when baked into bread, at the door *g*, which, when closed, is intended to be air tight at its joints. The steam and vapour as it arises from the baking dough,

ascends into the recess *h*, and passes off by the pipe *i i*, to a refrigerating worm in the tub *k*, where the vapour becomes condensed, and may be drawn from the worm by a cock at its lower extremity.

In order to ascertain the temperature of the oven, a thermometer, *l*, is inserted in a tube, extending downwards from the top of the recess *h*, and it is stated that the proper heat of the oven, when in operation, should be from 280° to 310° Fahrenheit.

The fuel is to be fed into the furnace, and ignited through the ash pit *m*. It is proposed, that a basket grate be employed, and that it be slidden in and out upon the horizontal bar *n*, the air being supplied to support its combustion from the opening in front of the ash pit.

Another mode of supplying the furnace with fuel, and of heating the oven, is proposed, which is, by carrying the furnace round under the oven upon a rotary horizontal frame made to revolve by means of bevel gear beneath, in a similar way to Brunton's plan of constructing furnaces for steam engines, and feeding them with fuel from a hopper.

It is, however, to be observed, that any peculiar construction of furnace, or oven, forms no part of this invention, but that it consists solely in connecting an oven for baking fermented dough, with a refrigerator, by a pipe which shall conduct the steam and alcoholic vapours from the oven to a refrigerator, there to be condensed into a diluted spirit, which may be employed by the rectifier for the production of a pure spirit.

The patentee closes his specification by saying that he claims to be the inventor, of "an economical apparatus, or machine to be applied to baking, consisting of a combination of an oven for baking fermented dough into bread, with a conducting pipe leading to a refrigerator or condensor, for the purpose of saving and collecting the liquid materials which are evolved from the dough during the process of baking, whatever may be the kind of metal or substance of which the oven is made."

Remarks by the Editor of the London Journal of Arts and Sciences.

We subjoin the following remarks upon the above invention, extracted, by permission, from a work by James Jennings, Esq. now in the press, entitled, "The New Family Cook," in which, under the article *bread*, the author says: "Concerning the heat necessary to be employed in an oven for baking bread, (which is said to be 450,° as usually practised by bakers,) it may here be observed, that if what is stated in the specification of Hick's patent be true, and we see no reason to doubt it, it is evident that the degree of 450 is by far too much. It must be remembered, however, that when an oven is heated to this high temperature, the fire is wholly withdrawn, and consequently from the moment of its withdrawal, the heat gradually declines; but, in the baking of metropolitan bread, as practiced by the company formed under this patent, the heat is, we presume, constantly kept at the same degree, or nearly so, and consequently insures not only a more complete baking of the bread than in ordinary ovens, but the most effectual disengagement of the alcohol, &c. We see every thing to commend in this process, and recommend this plan

of the equalization of heat during the whole time that the bread is in the oven to the attention of bakers generally."

The author adds, on the subject of kneading—"From what has been observed, concerning the metropolitan as well as French bread, we are decidedly of opinion that the ordinary bread every where to be met with in this country is *too much kneaded*, and in consequence is less raised than good and wholesome bread ought to be. It is evident that if bread be kneaded just before it is put in the oven, as ordinary bread is, by rolling, as well as otherwise, some of the gas to which its porousness is owing must escape; while, on the contrary, the French bread, and we conclude the metropolitan bread, baked in tins, does not undergo the last process of kneading and rolling, which common bread does; and hence, the superior wholesomeness of these breads when well baked, to the ordinary bread of the shops.

"It is not meant by these observations that the dough is not to be kneaded at all, far from it: when the water and other ingredients necessary for forming the flour into dough, are added, the mass should be well kneaded in order to their complete mixture; but afterwards, when the fermentation has begun, all further kneading should as much as possible be avoided: where spirit is to be obtained from the bread, this is of the utmost importance." [*Ibid.*

Specification of a patent granted to JOHN HOWARD KYAN, *Esq., for an improved mode of preserving Paper, Canvass, Cloth, and Cordage for Ships and other uses; and the Raw Materials of Hemp, Flax, or Cotton, from which the same may wholly or in part be made. Dated September* 22, 1832.

To all to whom these presents shall come, &c. &c., now know ye, that in compliance with the said proviso, I, the said John Howard Kyan, do hereby declare the nature of my said invention to consist in steeping the several manufactures and materials, hereinbefore specified, in a solution of deutochloride of mercury in water. And in further compliance with the said proviso, I, the said John Howard Kyan, do hereby describe the manner in which my said invention is to be performed, by the following statement thereof, that is to say:

Having prepared or constructed a large tank or reservoir of wood or other suitable material, I fill it about two-thirds full of deutochloride of mercury, or, as it is more commonly called, corrosive sublimate, dissolved in hot or cold water, in the proportion of one pound of the sublimate to five gallons of water; and into this liquid I put the said manufactures and materials hereinbefore specified, and, keeping them completely covered by the liquid, steep them, for various periods, according to the nature and substance of the manufacture or material, the object being, that a complete saturation should take place;—thus, for instance, a thin piece of calico cloth may be left in the liquid for one day, while a thick piece of canvass may remain a week, and cordage proportionably longer: the raw materials also will

be subject to the same rule of complete saturation. When removed from the tank or reservoir, the manufactures or materials should be first thoroughly dried, and then may be washed in any number of waters, hot or cold, to remove any portion, in excess, of the deleterious matter which may be supposed to remain in them, for the action of the deutochloride having once taken effect upon the matter which promotes decay, a chemical change is effected in it, which no subsequent washing can destroy, and which renders the longer presence of any deleterious matter quite unnecessary.

Now whereas I claim as my invention, the preservation of paper, canvass, cloth, and cordage, for ships, and other uses, and also the preservation of the raw materials of hemp, flax, or cotton (from which the same may wholly, or in part, be made) from decay, by immersing and steeping, or saturating, the same in, or with, a solution of corrosive sublimate in water, and thus submitting that matter contained in the said manufactures and materials which most promotes decay, to the action of deutochloride of mercury as hereinbefore described. And such my invention being, to the best of my knowledge and belief, entirely new, and never before used within that part of his said Majesty's United Kingdom of Great Britain and Ireland, called England, his dominion of Wales and town of Berwick-upon-Tweed, nor in any of his said Majesty's colonies or plantations abroad, I do hereby declare this to be my specification of the same, and that I do verily believe that this my said specification, doth comply, in all respects fully, and without reserve or disguise, with the proviso in the said hereinbefore in part recited letters patent contained, wherefore I do hereby claim to maintain exclusive right and privilege to my said invention. [*Rep. Pat. Inv.*

¶ *Facts relating to Mr. Woolf's Invention of applying High-pressure Steam Expansively. Extracted from Mr. Farey's Evidence before the Select Committee of the House of Commons in* 1829, *on the Law relative to patents for Inventions, printed in the Report of that Committee.*

Continued from Vol. XII. p. 354

The specification to Mr. Woolf's patent of 1804* claims the improvement of working steam engines by high-pressure steam, acting expansively, either in one or in two cylinders, and describes the structure and mode of operation of engines of both kinds. It was at that time quite a new proposal, but the general opinion of engineers was very unfavorable to it.

* Printed in the Philosophical Magazine, vol. xxiii. p. 335, or Repertory, second series, vol. vi. p. 84. The system of working expansively with steam of the ordinary atmospheric elasticity was invented by Mr. Watt, who had a patent for it in 1782; he proposed to do it in one cylinder, and executed it with success. Mr. Hornblower proposed to do the same in two cylinders, and had a patent in 1784: but that plan did not in practice prove so advantageous as Mr. Watt's with one cylinder, and never came into use.

In the course of four or five years, Mr. Woolf made a few small rotative engines in London, some with two cylinders, others with one, but he met with no encouragement, and lost much money; until 1811, when he had brought his small rotative engines, with two cylinders, to such perfection, that on a well attested trial of a nine-horse engine and corn mill, it ground 17¼ bushels of wheat by the consumption of one bushel of coals; and on a repetition of the trial, nearly 20½ bushels. Mr. Watt's rotative engines of that power will not do half so much.

From that time there has been a demand for Mr. Woolf's rotative engines with two cylinders, and a great number have been made: they have answered very well, and, on an average, consume only half as much fuel as the average of Mr. Watt's engines, exerting the same power. About 1813 Mr. Woolf obtained encouragement in Cornwall, and went to reside there; his partner, Mr. Edwards, continued the business by himself in London. In 1815 Mr. Edwards took out a patent in France, and sent over some engines, which were so much approved that he was induced to remove to Paris, where he has since made a great number of Mr. Woolf's engines. Also about the time that Mr. Edwards went to France, Mr. Hall began making Mr. Woolf's rotative engines with two cylinders, at Dartford, and has executed a great many excellent engines; most of them have been sent to France, where Mr. Woolf's engines are very common, and are greatly preferred to any others. Mr. Hall continues the business on an extensive scale.

Mr. Woolf's first engines for pumping water from mines were set up by him in 1814 at Wheal Abraham and at Wheal Vor mines in Cornwall; they had each two cylinders; their performance far exceeded that of any steam engines ever made before. In the latter half of 1815, the two engines raised, on an average, 48 million pounds of water one foot high, for every bushel of coals they consumed. Thus:

Engines.	Half of 1815.	1816.	1817.	1818.
Wheal Abraham*	48.63	49.71	44.07	36.91
Wheal Vor	47.63	44.23	36.15	29.33
Average	48.13	46.97	40.11	33.12

* Wheal Abraham engine raised 56.92 millions, on the average of all the month of May, 1816. In 1818, this engine was put in order, and exact trials of its performance were made by Mr. Farey, with the steam kept up to a greater elasticity than usual, and acting with a greater extent of expansion than usual; it then raised 65.22 millions, on the average of two trials of eight hours and six hours each: that was the greatest effect ever produced by steam, until November, 1827, when Woolf's engine at the Consolidated Mines raised 67.10 millions, on the average of the month's working.

The steam cases for the cylinders of these engines were exposed to the open air without any clothing. See a description of the cylinders, Philosophical Magazine, vol. xlvi. pp. 116, 236, 319, and 398; and the performance for each month is stated in the numbers of the succeeding volumes up to the end of 1818.

To estimate the improvement thus effected by Mr. Woolf, by himself alone, without aid from any other engineers, and whilst he was opposed by many, the performance of the engines previously used in Cornwall must be examined.

Mr. Watt first introduced his engines into Cornwall in 1778, in place of Newcomen's atmospheric engines, which had been introduced there about fifty years before, but had never raised more than eight or nine millions. Mr. Watt did twice as much with his first engines, and three times as much, after he had applied his method of working expansively, for which he had a patent in 1782. It consists in stopping the supply of steam from the boiler to the cylinder, when the piston has only moved through a portion of its course, leaving it to be impelled through the remainder, by the expansive action of the steam already admitted into the cylinder, without any further expenditure of steam from the boiler.

Mr. Watt proposed, in 1782, to work his engines by stopping the supply of steam when the piston had only moved one fourth of its course, leaving three-fourths of its course to be performed by the expansive action; and although the force exerted by the steam during that expansion must continually decrease, nevertheless $2\frac{1}{3}$ times more power would be exerted on the whole than would be exerted by the same steam, if it acted without expansion. But it was found that such an extent of expansive action could not be realized in practice, because the steam used by Mr. Watt, when expanded to fill a quadruple space, becomes too feeble to impel a piston with effect.

Mr. Watt never retained the steam in his boilers much above the pressure of the atmosphere; they were always supplied with water through upright pipes, open at top to the atmosphere, and the lower ends immersed beneath the surface of the water in the boilers; the open ends of the feeding-pipes being only eight feet high above that surface, the steam could not by any chance be retained in the boiler beyond $3\frac{1}{6}$ pounds per square inch, more elastic than the atmospheric air: that was Mr. Watt's practice, and his successors in business at Soho, still continue it. The term low pressure steam, can only, with propriety, be applied to the steam produced by such boilers.

Mr. Watt's engines with such boilers, cannot be made to exert a competent power to drain deep mines, unless the supply of steam to the cylinder is continued, until the piston has run through more than half its course; and, on an average, in practice, low-pressure steam is only expanded so much, as to fill one and a half time the space it occupies in the cylinder, at the moment when the supply was cut off: even with that moderate extent of expansive action, the steam will exert nearly one-half more power than would be exerted by the same steam acting without expansion, as it must do, if the supply from the boiler to the cylinder were continued until the piston terminated its course.

Mr. Watt's engines, well constructed and well managed, will raise twenty-five millions for an average. They are still the only

engines used in London for water-works, and in many districts for draining mines, they were the only engines used in Cornwall in 1814, when Mr. Woolf set up his first engines there. Under favourable circumstances, such as having little work to do, keeping up the steam as strong as can be retained in the boiler without overflowing the feeding pipes of eight feet high, and working with the utmost extent of expansive action that those circumstances will allow, using good coals, clean water, plenty of cold condensing water, and the boiler, cylinder, and steam-pipes being properly clothed,—a well constructed engine of Mr. Watt's may raise thirty two millions; but that is the utmost, and cannot be maintained in regular working. On the other hand, a number of engines working incessantly at deep mines, under ordinary management and average circumstances, will not reach twenty millions, as is shown by the following account of the average performance of the engines in Cornwall, in 1813 and 1814, when they were all worked on Mr. Watt's system of low-pressure steam acting expansively in one cylinder.

Date of Year	Aggr. of the Engines in Cornw.				Aver. per Engine.		Annual Performance of the best Engines. Millions.
	No. of Engines	Aver. Mills.	Bushels per Ann.	Horse Power.	Bushels per month.	Horse Power	
1813	24	19.38	770076	861	2672	35.9	26.65
1814	29	20.37	1002563	1176	2880	40.5	31.99
1828	56	373.3	1165866	2508	1735	44.8	77.29
1829	53	412.2	985435	2342	1550	44.2	76.23

In 1813, the highest performance attained by the best engines on Mr. Watt's system did not reach thirty millions and the performance of the engines averaged less than twenty millions; but in 1829, when all the engines were worked on Mr. Woolf's system of high pressure steam acting expansively in one cylinder, the best of those engines averaged seventy-six millions, and the whole number (being more than twice as many as in 1813) averaged forty-one millions.

The great cause of the superiority may be thus explained; Mr. Woolf's engines are worked by high-pressure steam, which is retained in the boiler to an elasticity of between twenty-five and forty-five pounds per square inch more than the atmospheric air. Steam of that elasticity may be expanded to fill between five and eight times the space it occupied when first admitted from the boiler into the cylinder; and yet it will have a sufficient force to impel the piston with as much effect, during all that great extent of expansive action, as can be done in Mr. Watt's engines when the expansion is only from one space into two; hence Mr. Woolf's system renders the expansive action available to a greater extent than can be done in Mr. Watt's system. There are other concurrent causes for the great superiority, but that is the principal cause.

In his specification of 1782, Mr. Watt proposed to use steam equal to the atmosphere, with a far greater extent of expansive action than he or his successors have been able to realize in practice; and so Mr. Woolf, in his specification of 1804, proposed to carry the expansion of high-pressure steam to a far greater extent than has ever been executed by himself or others.*

When Mr, Woolf began, it was a common notion that mere variation in the elasticity of the steam employed, could no way affect Mr. Watt's invention of expansive working, and that the use of high-pressure steam, as proposed by Mr. Woolf, could never be advantageous. Such notions continued current, until he proved their fallacy by the great performance of his engines: but he did not attain that proof without exertion, for the difficulties of carrying his invention into effect were very great, and cost him some years of uninterrupted labour and great expense to overcome them. He encountered much active opposition from those who had made up their minds on his first proposals; and their unfavourable opinions prevented him from getting orders for any large engines until 1813.

The value of the improvement which Mr. Woolf made in the performance of engines, before his system was adopted or countenanced by other engineers, may be stated as follows. In 1814, the average performance of the twenty-nine engines that were reported, was 20.37 millions, and their consumption of coals was 1,002.563 bushels. The price of coals being at that time 14½*d.* per bushel, the cost of coals was 60,570*l.* per annum, or 2088*l.* per annum for each engine, on an average.

The average performance of Mr. Woolf's engines at Wheal Abraham and Wheal Vor, during the three years and a half above cited, was 42-08 millions, or more than double the average of all Mr. Watt's engines in 1814; hence if all those engines had been replaced by engines such as Mr. Woolf had then made, more than half the expense of coals would have been avoided, being a saving of 29,300*l.* per annum to the mine adventurers; or at the rate of full 1000*l.* per annum saved in working each engine, on an average of the whole number, each engine exerting about forty horse power.

The expense and complication of Mr. Woolf's engines with two cylinders being found objectionable, he altered an old Watt's engine at Wheal Abraham in 1816, to work by high pressure steam, with an increased extent of expansive action, in one cylinder; and the improvement in its performance proved that two cylinders

* If it is represented as a failure, that Mr. Woolf did not accomplish all that he anticipated, in 1804, still that is no reason for overlooking what he did accomplish by himself in 1811 and 1815, or how much he then surpassed all that had been done before: nor can any such imputation of failure justify the omission of his name by those writers who undertake to state the extention that has been given to Mr. Watt's discovery of expansive working, by using high pressure steam; for that extension is not due to Mr. Watt in any part, but to Mr. Woolf entirely.

are not essential to the successful practice of his system.* He altered another old engine at Wheal Unity, by adding a small cylinder to it; the performance was improved in about the same degree as that of the old engine with one cylinder.

[TO BE CONTINUED.]

¶ *Report of the Board of Examiners, appointed by the Connecticut River Steam Boat Company, to inquire into the causes of the Explosion of the Steam Boat New England, which occurred at Essex, October 9th,* 1833.

The undersigned, having been requested to examine the remains of the Steam Boat New England, and to make inquiries with a view of ascertaining the causes which led to the disastrous explosion on board of that Boat, respectfully REPORT.—

That on the 7th of November, we met at the borough of Essex, and proceeded to examine the present state of said boat, and the remains of the boilers. On visiting the steam boat, we found that those portions of the guards and railing, on which the boilers had been placed, together with the boiler houses, railings, and the other contiguous wood work, had been entirely destroyed by the effects of the explosion. The front of the ladies' cabin upon the quarter deck, had also been forced inward, and partially destroyed, and that part of the upper, or promenade deck, which extended from said cabin to the engine room near the centre of the boat, had been swept entirely away. The engine remained without injury; but the steam pipe which led from one of the boilers, was broken off at its junction with the main steam pipe in the engine room, near the point where it unites with the steam pipe from the starboard boiler. The *safety valve*, which is attached to the main steam pipe at the junction of the two branch pipes, near the engine, remains unimpaired, and is a large, and apparently well constructed, valve. A mercurial *steam gauge* is attached to the main steam pipe at this point, which serves to indicate to the engineer the pressure of steam in the boilers. The mercury was not thrown from this gauge by the explosion, and the gauge remained in good order after the accident. Two other mercurial gauges of the same description were shown to us, which had been attached one to each of the boilers, on that part called the steam chimney, which having no water in contact with its inner surface, becomes heated more than any other portion of the boiler. These gauges had been torn from their places at the time of the explosion, and in one of them a portion of the mercury with which it had been charged, was found remaining after the accident. It was ascertained on admeasurement, that these steam gauges were calculat-

* The same fact had been ascertained years before, in respect to Watt's system of working expansively by low-pressure steam; for Mr. Hornblower, who practised that system in two cylinders, did not succeed so well as Mr. Watt himself, who only used one cylinder.

ed to resist a pressure of about 32 pounds to the inch without discharging the mercury. Near the lever of the safety valve, which is inclosed in a small room on the upper deck, is a thin board partition inclosing the engine, a small portion of which had been moved from its temporary fastenings, and had been permitted to fall back into a slightly inclined position, which brought it in contact with the weights of the safety valve, at a point below the centre of the partition. This part of the partition, or bulk head, was in the form of a battened door, of the height of seven feet, and could fall no further from its place than to bring its top against a small beam, or carlin which crossed at the distance of fourteen inches from its perpendicular position. It does not appear that this door-like portion of the partition was in contact with the valve weights at the time of the accident; but, in order to ascertain the effect which, in any possible case, it might have upon the safety valve, several experiments were made, in which it appeared that no perceptible resistance to the raising of the valve resulted from this source. Nor was the resistance to the rising of the valve much increased, by the force of one man applied in drawing the door into firmer contact with the weights; and with the united force of two men, thus applied in the impingement, there was no difficulty in raising the lever with the hand. No importance therefore can be attached to the circumstances of this partition, even had we not obtained evidence, as we afterwards did, that the door was in its perpendicular and proper position on the morning after the accident. We may add, that no obstruction of this kind could have prevented the action of the three mercurial gauges, which, by blowing off the mercury when the pressure exceeds a certain point, may, (when not charged beyond the point of safety,) be considered as cautionary safety valves of the most perfect character.

The mutilated portions of the *boilers* which were examined, gave abundant evidence of the great power or force of the explosive action. The material was rolled copper of the usual thickness. The original form of each boiler* was semi-circular, with extended sides, the latter descending perpendicularly; and uniting at bottom with similar extensions of two inferior arches which severally formed the roofs of the two furnaces or main flues, that extended longitudinally through each boiler. The interior extension of these arches also descended, in two parallel sides, to the bottom of the boiler, forming, like the two sides of the boiler, what is technically called a *water-leg*. These parallel or flat sides, as well as the middle leg, were connected at distances of nine inches by copper bolts of seven eighths of an inch in diameter, which passed through the sides, and fastened the internal to the external plates or surface of the water legs, the space remaining between which, for the reception of the water, was from three to four inches. The arches or roofs of the furnace flues, were also connected

* See the annexed figures.—pages 58, 59.

by long brace-bolts, and other fastenings, to the upper parts of the boiler as a further security against the downward pressure to which the arches are subject. Above these arches, in the interior of the boiler, were placed five round *flues*, surrounded by the water, and extending longitudinally through the boiler on a horizontal level. The fire, after passing under the arches through nearly the whole length of the boiler, returned through these flues to the front of the boiler, where the flues united by one common connection with the chimney. The lower part of the chimney, for a few feet in extent, is formed by a vertical extension, in the cylindrical form, of both the inner and outer shell of the boiler. These internal and external cylinders are secured to each other by brace bolts as before described. In this portion of the boiler the steam is heated and rarified by the passage of the fire or heat through the inner cylinder or flue as it ascends the chimney. This part of the boiler is called the *steam chimney*, and here were attached the pipes which conduct the steam to the engine. These portions of the boilers have received no injury from the explosion, but were severally found attached to the flues of one boiler, and to the remains of the outer shell of the other. The cylindrical flues, which must have been the soonest exposed to the action of heat, in case of the deficiency of water, remain in the most perfect order, those of each boiler being still united to each other by their terminal connections, and no evidence of exposure to heat has been discovered. Those of the larboard boiler were thrown on end against the enclosure of the water wheel, and those of the starboard boiler have been since found in a position which shows that they had been thrown sternwise over the boat, and had fallen into the river at some distance from her larboard quarter. The shell of the same boiler was separated from the flues, and thrown outwards into the river; and that of the larboard boiler was also separated from the flues and thrown towards the shore, and was found resting upon the margin of the wharf, the boat being perhaps thirty yards distant from the wharf at the time of the explosion. Both the external shell, and internal arches of the boilers, have entirely lost their original form, and, to a considerable extent, this form is inverted or turned inside out. The whole was found to be dismembered and torn in a manner which it is difficult to describe. The boilers were not, as occurs in some cases of steam boat explosions, rent merely in the main flue, thus giving vent to the steam, or, as in other cases, with a head torn off and lacerated, and still retaining their external form, and remaining in their beds; but the boilers of the New England were torn asunder, and folded in massy doublings, like a garment; and they were so crushed, flattened, and distorted, that, as they lay upon the wharf after they were raised from the bed of the river, it was difficult for a common observer to discover how the mutilated parts were ever connected into symmetry, so as to combine just proportion and strength.

The appearance of the boilers, however, was such as to indicate that they had been constructed in a substantial manner. The cop-

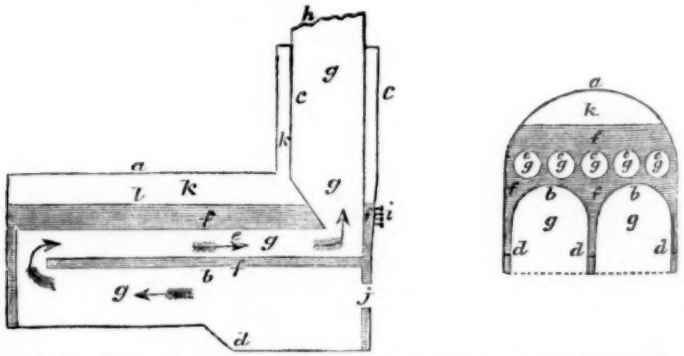
per, in all the ruptured parts, had every apearance of being tough and free from flaws; nor did it exhibit the flaking, and discoloration, which great heat is known to produce upon the metal when not covered by water. The metal varied in thickness in the different parts, the legs being made of No. 3, the shell of No. 4, and the return flues of No. 5; the strength being in each case adapted to the situation or degree of exposure; and much additional strength was further secured to all parts of the boilers by a frequent and liberal use of bolts and braces. The after ends of the two boilers still remain in the river,* all attempts to discover them having as yet proved ineffectual.

The appearance of the several parts on a careful examination seemed to indicate that the disruption had *commenced* in the arches of the main, or furnace, flues, at some point near to their posterior termination, where they unite with the upper flues and after end of the boiler. On this point, however, nothing of a very positive character can be ascertained, although the entire separation and loss of the ends of both the boilers, strengthens the supposition as does also the fact that the flues of the larboard boiler, which first exploded, were thrown forward against the water wheel. Some slight imperfection and leakage in this portion of both boilers had been discovered, and was repaired at Hartford at the termination of the previous trip.

Having finished our survey of the wreck, we then proceeded to the examination of *witnesses*, who were duly sworn by an attending magistrate. And here we may remark, that the general aspect of the testimony and the manner of the several witnesses, bore every mark of the simplicity of truth; and we cannot doubt that on all the essential points, we have obtained the honest declaration of all the circumstances that came within their knowledge and observation.

Boilers of the New England.

Longitudinal Section. Cross Section.



* Since the examination, both of them have been found in the river; they were blown far astern of the steam boat.

a The outer shell of the boiler. *b b* The arches or tops of the main or furnace flues—*c c* The steam chimney.—*d d d* The water legs.—*e e e e e* The upper or return flues.—*f f f* The water in the boilers.—*g g g g g* The passage for the fire through the flues to the chimney.—*h* The iron chimney pipe cut off above its junction with the steam chimney.—*j* The furnace door.—*i* The water cocks.

Testimony of ALEXANDER MARSHALL, *Engineer.*

Was engineer of the Steam Boat New England, on the 8th of October last. Left New York a few minutes after 4 P. M. on that day, with a light pressure of steam. The engine having been started cold, the steam did not increase till we had proceeded as far as Hurlgate.

The average pressure used on the passage was from 10 to 12 inches. The steam rose after starting from 8 to 14 or 16 inches. At 7 P. M. left the engine in charge of Mr. Younger, the assistant engineer, and retired to rest with a view of taking his watch at 10 P. M. Was called by Mr. Younger at 10 o'clock. There was a heavy sea in the Sound, and, in consequence of orders from Capt. Waterman, the steam was reduced to 8 or 9 inches. Was obliged to stop before arriving in the river, by order of the pilot, in order to adjust the wheel rope. Arrived in the river about one o'clock A. M. Missed the wharf at Saybrook, and after a second attempt to gain the wharf, some difficulty occurred with the lifting valves, in consequence of the binders by which they are confined being screwed too tight, which made it necessary to anchor. After loosening the valve rods, the boat got under way, and landed at Saybrook. Landed also at Lythe. Just before landing at Essex, went into the fire room and examined the gauge cocks (water cocks,) and found the water good in the boilers. This was three or four minutes previous to the explosion. The boat was stopped about two minutes at Essex to land a passenger, with the small boat. Took hold of the pulley of the safety valve for the purpose of raising it, and at this moment the explosion took place. Does not know whether he had lifted the valve or not.

Being further examined, he says, that the steam gauge did not exceed 14 inches while in the Sound, nor 10 inches after entering the river. This statement is not founded on actual measurement. There was no scale of inches marked to either of the steam gauges. Refers only to the height of his own gauge in the engine room. Is aware that the steam gauges in the two fire rooms ranged considerably higher. Ascribes the difference to the greater expansion of the mercury in the fire rooms from their proximity to the fire. Had a greater pressure of steam immediately previous to the explosion than was proper to use in the river, where the boat does not steer well under a strong power, and this was the reason why witness attempted to raise the safety valve.

Witness further says, that the New England commenced her first trip on the 10th of August last under the charge of witness as engineer, he having been employed to set up the engine. The charge of the engine was afterwards given to Mr. Potter, the engineer of the company who owned the boat.

Witness again took charge of the engine on the trip previous to that on which the accident occurred, in consequence of the illness of Mr. Potter. Witness was employed as engineer of a steam boat at the South twelve years ago, which boat was run by him during the season of navigation. Says that his management on the night of the accident was not at any time influenced by a desire to shorten the passage. Heard no inquiry made by any of the passengers about racing. The only fuel used in the New England was pine wood. Witness has been twenty years engaged in his present business. Has served a regular apprenticeship in the manufacture of engines. Has been employed in New York by Mr. M'Queen, Mr. Allaire, Mr. Sabbatton, and the West Point Foundry Association.

The safety valve of the New England was loaded 18 pounds to the square inch, and its position on the steam pipe is 20 feet, or more from the boilers. Besides two regular weights, on the safety valve, there were two extra weights, a 50 lb. and a 28 lb. The valve will blow off at 8 pounds to the square inch, with the two regular weights. This is owing to the lever of the safety valve having been shortened about 2 feet to bring it within the walls of the room by which it is enclosed. The diameter of the safety valve is 10½ inches. The diameter of the steam pipes which lead from the boiler is about 10 inches.

Testimony of Robert Younger, *Assistant Engineer.*

Witness started from New York at a few minutes past 4 o'clock P. M. as assistant to Marshall. At 7 P. M. Marshall left the engine in charge of witness. About half past 8, Capt. Waterman came to the engine room and asked if the engine did not labor too much in the sea? Also inquired the height of the steam gauge; was answered 10 inches. Capt. Waterman requested him not to carry any more. Witness then blew off steam and went to the fire room and gave directions for less fire. Run with steam from 8 to 10 inches till Mr. Marshall came on deck at 10 o'clock. Witness examined the water in the boilers frequently on the passage. Did not see the height of the steam gauge for the last 10 or 15 minutes previous to the explosion, because his view of the gauge while standing at his post in the engine room, was obstructed by an appendage to the steam pipe. There was no difficulty occurred in the management of the water in the boilers. One of the boilers foamed once while Mr. Marshall was below. This was immediately stopped by putting oil into the force pump. The steam was blown off at Saybrook while lying to for the purpose of loosening the binders of the lifting rods. This was before landing at Saybrook

Point. The position of the bulk head did not prevent the raising of the safety valve. Witness saw the movable part of the bulk head in its proper place on the morning after the accident. Is certain of this fact from his own personal examination. Has never witnessed an accident of this kind before. Has been twelve years engaged in the business of making engines. Made his first trip as an acting engineer in the New England when the boat was first started. Assisted Marshall in fitting up the engine. Thinks that there was no want of water above the flues, but is of opinion that the steam had blown the water from the legs of the boilers.

Testimony of WILLIAM VAIL, *Pilot.*

Says that the New England left New York, at 12 minutes past 4, P. M. in company with the steamboat General Jackson. The steamboat Boston left the wharf soon after the New England. The Boston gained upon the New England till they reached Hurlgate. The New England then got steam on, and drew away from the Boston. Found a heavy sea in the Sound, after passing Sand's Point, and the Boston then preserved her distance. The New England steers very badly. After passing Falkner's Island, the wheel rope got foul, and detained us a few minutes, and the boat fell into the trough of the sea. Off Killingworth, and again off Duck Island, the same detention occurred. When off Cornfield Point, (Saybrook,) witness told the Engineer, that the boat would not steer in the dark with such a heavy sea, and told him not to carry over 7 inches, and repeated the same direction to the Engineer, when in the river. When crossing the bar at the mouth of Connecticut river, the boat steered very badly, and was obliged to ring the bell to shut off the steam. Missed the dock twice at Saybrook, in consequence of no person being on the dock to take a line. Backed down to near the Fort, where owing to some difficulty with the valves, the boat could not be started ahead, and was obliged to anchor to prevent drifting on shore. Went again to the engine room, and waited twenty minutes for the engineer to get ready for a start. Looked into the fire rooms and asked if the water was plenty in the boilers, and was answered "yes." Got up the anchor and landed at Saybrook. Started again from Saybrook, and was obliged again to order the steam shut off, because it was difficult to steer the boat. Landed at Lyme, and on starting again found that the boat jumped so with a head of steam, and steered so hard, that it was necessary to shut off the steam again, and continued shut off till we reached Essex, seven miles from Saybrook. Was detained three or four minutes in landing at Essex. When the small boat had landed, Capt. Waterman, gave the word, and witness rung the bell to start the engine, and the explosion immediately followed.

The steam was not blown off at Essex. Witness thought at the time, there was too much steam on. Heard but one explosion, which was like a heavy fall or crash. Had been pilot of the N. E. for 30 days, which was nearly as long as the boat had run. The

accident occurred an instant after ringing the bell to go ahead. Witness had felt apprehensions for his personal safety, on account of the pressure of steam which was carried. Judged of this by the motion of the engine and the management of the boat. Saw at Saybrook, the steam gauge standing at 12 or 14 inches, and cautioned the firemen against carrying too much steam. The stop at Essex was not longer than 3 or 4 minutes.

The greatest distance gained of the Boston, was about two miles and a half, which was near the head of the Sound. The Boston was nearly abreast when we entered the river. Witness is unable to make up his mind as to the cause of the accident, but thinks that the rent commenced in the legs of the boiler near the after end.

Testimony of GILES FARNHAM, *Fireman.*

This witness was on duty at the larboard boiler. Took the first watch from New York, and went below at 8 o'clock. Took his second watch after 12 o'clock, just before boat entered the river. There was but 8 or 10 inches steam on the boiler before the boat arrived at Saybrook. The steam gauge rose to 12 or 13 inches while lying at anchor at that place. Blew off the steam to 7 inches and pumped water by hand into the larboard boiler. Witness says the water was lower in the boiler at this time than at any other, being at the 2d cock. The other boiler needed no supply. Witness examined the water every five minutes. Started from Saybrook with water at 3 cocks, and kept it afterwards at 4 cocks till the time of the accident. Above Lyme, there was more steam on than there ought to be for the river. The floating stick of the steam gauge in the larboard furnace was within two inches of the upper or boiler deck when the boat stopped at Essex, and witness supposes it must have reached the deck previous to the accident.

While the boat was stopped at Essex, tried the water cocks and found the water as high as the upper cock. The witness then went over to the starboard fire room and told Bell, the other fireman on duty, that "he would not have to fire up again for a week if they went on so." Had but a moderate fire at this time in the furnace. Says, the extra pressure was owing to the engine being shut off so much. At the moment of the explosion witness was sitting on the rail of the fire room gangway, at the outside of the guard, conversing with Bell, the other fireman. Witness heard a sudden cracking of the boiler, and attempted to look round to see what was the matter, which is the last he knew till he found himself in the water. Was severely scalded, but succeeded in swimming to the shore. Witness says that when there was no steam on the boiler, the top of his gauge rod was so short as to fall three inches below the top or muzzle of the steam gauge, and therefore did not indicate so much pressure as the gauge of the other boiler, that is, did not indicate the whole amount of pressure by three inches.

Testimony of EDWIN BELL, *Fireman.*

Was in charge of the starboard boiler at the time of the accident. Left New York with seven inches steam, and carried about the same pressure till through Hurlgate, after which carried 12 or 13 inches till dark.

Was then directed by Mr. Younger, to keep 8 or 9 inches, which was done till 8 o'clock, when witness took his watch below. Came on duty, and took the fire again at Saybrook, at which time there was 8 or 9 inches of steam on, and the fire was run down. Capt. Waterman, came and asked witness about the water, examined and found three full cocks. Witness had no occasion to supply his boiler by the hand pump. At Lyme, the steam gauge was at 12 or 13 inches, and on reaching Essex, the gauge rod was within 3 or 4 inches of the upper deck.

When the boat stopped it soon rose to the deck. Witness then turned off the condensed water from the steam gauge, which caused it to fall about 2 inches, but it soon rose as high as before. Tried the water cocks and found good solid water at three lower cocks, and steam and water at the upper cock. Went over to the larboard boiler when we first stopped at Essex, and found 3 cocks of good water and the gauge rod 3 or 4 inches from the deck. The gauge rod of the starboard boiler usually stood higher than the one in the larboard fire room.

Witness never saw the float rods of the steam gauges so high as at this time. Has run in the boat from her first trip. Witness told Giles (Farnham,) when the latter came into his room, "that they would not have to fire up more than once more during the whole watch."

There was a light fire kept up between Lyme and Essex. Witness heard no steam blown off at Essex. The accident happened about 3 o'clock in the morning. The New England came out from New York before the Boston. At 8 o'clock, the Boston was about 2 miles astern.

Testimony of ISAAC SEYMOUR, *Mate.*

Agrees in the statements made by Mr. Vail. In the Sound from Sand's Point to Matinecock Point, the steam stood at the pressure about 8 inches, and Mr. Marshall was sometime blowing off. Marshall said that it was made faster than he wanted it, and that he should speak to the fireman. Thinks there was 10 or 12 inches on the gauge in the engine room, at the time when the boat was anchored at Saybrook and they commenced blowing off. Saw the water tried in the boilers at Saybrook, which showed plenty. The larboard boiler was then pumped into by hand.

Perceived no difficulty in working the boat except at Saybrook. Was not apprehensive of any accident. Was employed in landing with the small boat at Essex. Saw Mr. Marshall visit the fire room just before the landing at Essex. Witness was facing the dock when he first heard a cracking noise, and was in the act

of turning towards the steam boat when the explosion instantly followed.

The larboard boiler, which was nearest to witness, exploded a little before the other. Could just perceive the difference.

Testimony of Roswell Potter, *Engineer.*

Witness has run the New England as engineer since she first commenced running except the first and last trip, when he stayed back on account of ill health. Had no reason to expect that any thing would go wrong. Usually carries from 14 to 17 inches of steam on the boilers of the New England. The engine is intended for carrying 16 to 18 inches. Safety valve, as loaded at the time of the accident, would begin to blow off at 18 inches. Had three steam gauges, which would rise from 31 to 32 inches without blowing out the mercury. Steam gauges of this length are now used in the steam boats. The gauges in the fire rooms would stand 3½ inches higher than the engineer's gauge in the engine room; supposes this to be owing to the loss of heat from the steam in passing through the steam pipe. Has run with Capt. Bunker to New Haven, with steam at 8 inches. This was several years ago. Boilers are now made stronger than those which were formerly used.

The extreme of safe pressure on the boilers of the New England, he thinks to be 22 to 24 inches. The boat would not sail faster with this pressure than with 17 inches. Has had 24 inches on the boilers; once, when the boat was on trial, and at other times since. This was occasioned by stopping the engine. Has not seen the gauge rods rise as high as the boiler deck in any case. Witness examined the steam gauge in the engine room after the accident, and found it in perfect order with the mercury remaining in the gauge. Also found mercury in one of the fire room gauges, both of which were torn down by the explosion. The height of the gauge rod when up to the deck in the fire room would be 28 inches. After turning off the condensed water from above the mercury, we get the true gauge. Has not known any racing with the New England, except with the steam boat Providence, on which occasion had bad wood, and could get a pressure of but 11½ inches. The engineer must stand constantly at the engine, to attend to the orders of the pilot. Was engineer of the steamboat Oliver Ellsworth for several years, and usually carried from 12 to 14 inches of steam on the boiler of that boat. The Oliver Ellsworth has the strongest boiler. The latter is made of stouter copper than those of the New England, is 9¼ feet in diameter by 16¼ feet in length, and is stronger braced than any boiler the witness has ever seen. The engine of the New England is nearly four times the power of that of the Oliver Ellsworth. Thinks that the middle legs of the boilers were heated, and that they now appear to be annealed, and different from the outside of the boiler. The force pumps of the New England are very large, and will fill the boilers running over full from Saybrook to Essex. The New England will steer well with

8 or 10 inches steam in smooth water. The Oliver Ellsworth formerly carried from 12 to 14 inches, and now carries 16 to 18 inches. The McDonough carries 12 to 14 inches. On being further examined, witness says that one of the boilers of the New England was patched twice on the middle leg at the after end, and that a similar patch was put upon the same part of the other boiler. There was a crack in the flange at this point, which made a leak, but these repairs did not stop it. This was the trip previous to the accident. The safety valve would commence blowing off at 18 inches, but had carried 24 inches with the same weights, with the steam blowing through the valve. The boilers had not been proved above 24 inches. Had found the brace bolts between the top of the furnace and the connection of the flues to the steam chimney, to be leaky, owing to a straitening in the angle of the braces. Had taken them out, and put strait screw bolts in their stead. This was on the second trip which the boat made. Considers the engine to be of 120 horse power.

[TO BE CONTINUED.]

Notice of a means of preparing the organs of respiration, so as considerably to extend the time of holding the breath; with remarks on its application, in cases in which it is required to enter an irrespirable atmosphere, and on the precautions necessary to be observed in such cases. *By* MICHAEL FARADAY, *Esq. D.C.L. F.R.S., &c. Fullerian Professor of Chemistry in the Royal Institution.*

There are many facts which present themselves to observant men, and which, though seen by them to be curious, interesting, and new to the world, are not considered worthy of distinct publication. I have often felt this conclusion to be objectionable, and am convinced that it is better to publish such facts, and even known facts under new forms, provided it be done briefly, clearly, and with no more pretention than the phenomena fairly deserve. It is this feeling which makes me send, for your acceptance or rejection, an account of an effect, new to me, and to all to whom I have mentioned it, and which seems to have some valuable applications.

At one of the scientific meetings at the apartments of his Royal Highness the President of the Royal Society, whilst speaking of certain men, who by means of peculiar apparatus for breathing, could walk about at the bottom of waters, and also of the pearl fishers; Sir Graves C. Haughton described to me an observation he had made, by the application of which a man could hold his breath about twice as long as under ordinary circumstances. It is as follows:—If a person inspire deeply, he will be able immediately after to hold breath for a time, varying with his health, and also very much with the state of exertion or repose in which he may be at the instant. A man, during an active walk, may not be able to cease from breathing for

more than half a minute, who, after a period of rest on a chair or in bed, may refrain for a minute, or a minute and a half, or even two minutes. But if that person will prepare himself by breathing in a manner deep, hard, and quick, (as he would naturally do after running,) and ceasing that operation with his lungs full of air, then hold his breath as long as he is able, he will find that the time during which he can remain without breathing, will be double, or even more than double, the former, other circumstances being the same. I hope that I have here stated Sir Graves C. Haughton's communication to me correctly; at all events, whilst confirming his observation by personal experience, I found the results to be as above.

Whilst thus preparing myself, I always find that certain feelings come on me, resembling, in a slight degree, those produced by breathing a small dose of nitrous oxide; slight dizziness and confusion in the head are at least produced; but on ceasing to breathe, the feeling gradually goes off, no inconvenience results from it either at the time or afterwards, and I can hold my breath comfortably for a minute and a quarter, or a minute and a half, walking briskly about in the mean time.

Now this effect may be rendered exceedingly valuable. There are many occasions on which a person who can hold breath for a minute or two minutes, might save the life of another. If, in a brewer's fermenting vat, or an opened cesspool, one man sinks senseless and helpless, from breathing the unsuspected noxious atmosphere within, another man of cool mind, would, by means of this mode of preparation, which requires nothing but what is always at hand, have abundant time, in most cases, to descend by the ladder or the bucket, and rescue the sufferer without any risk on his own part. If a chamber were on fire, the difference in the help which could be given to any one within it by a person thus prepared, and another who goes in perhaps with lungs partially exhausted, and who, if he inhale any portion of the empyreumatic vapours of the atmosphere, is stimulated to inspire more rapidly, and is therefore urged to instant retreat into fresh air, is so great, that no one who has noticed what can be done in a minute or two minutes of time, can doubt the value of the preparation under such circumstances, even though from want of practice, and from hurry and alarm, it may be very imperfectly made. In cases of drowning, also, a diver may find his powers of giving aid wonderfully increased, by taking advantage of Sir Graves Haughton's fact.

I have myself had occasion to go more than once or twice into places with atmospheres rendered bad by carbonic acid, sulphuretted hydrogen, or combustion; and I feel how much I should have valued at such times the knowledge of the fact above stated. Hoping, therefore, that it may be useful, I will add one or two precautions to be borne in mind by those who desire to apply it.

Avoid all unnecessary action, for activity exhausts the air in the lungs of its vital principle more quickly, and charges it with bad matter. Go collectedly, coolly, and quietly to the spot where help is

required: do no more than is needful, leaving what can be done by those who are in a safe atmosphere (as the hauling up of a senseless body, for example,) for them to do.

Take the precautions usual in cases of danger, in *addition* to the one now recommended. Thus, in a case of choke-damp, as in a brewer's vat, hold the head as high as may be; in a case of fire in a room keep it as low down as possible.

If a rope be at hand by all means let it be fastened to the person who is *giving* help, that he may be succoured if he should venture too far. It is astonishing how many deaths happen in succession in cesspools and similar cases for want of this precaution.

It is hardly needful to say, do not try to breathe the air of the place where help is required. Yet many persons fall in consequence of forgetting this precaution. If the temptation to breathe be at all given way to, the *necessity* increases, and the helper himself is greatly endangered. Resist the tendency, and retreat in time.

Be careful to commence giving aid with the lungs *full* of air, not *empty*. It may seem folly to urge this precaution, but I have found so many persons, who, on trying the experiment on which the whole is based, have concluded the preparation by closing the mouth and nostrils *after an expiration*, that I am sure the precaution requires to be borne in mind.

I have thought it quite needless to refer to the manner in which the preparation enables a person to increase so considerably the time during which he may suspend the operation of breathing. It consists, of course, chiefly in laying up for the time, in the cells of the lungs, a store of that vital principle which is so essential to life. Those who are not aware of the state of the air in the lungs during ordinary respiration, and its great difference from that of the atmosphere, may obtain a clearer notion from the following experiment:—Fill a pint or quart jar with water, over the pneumatic trough, and with a piece of tube and a forced expiration, throw the air from the lungs in their *ordinary state* into the jar: it will be found, that a lighted taper put into that air will be immediately extinguished.

A very curious fact connected with the time of holding the breath was observed by Mr. Brunel, jr., and has, I think, never been published. After the river had broken into the tunnel at Rotherhithe, Mr. Brunel descended with a companion (Mr. Gravatt, I think,) in a diving bell, to examine the place: at the depth of about thirty feet of water, the bell touched the bottom of the river, and was over the hole, covering it, but too large to pass into it. Mr. Brunel, after attaching a rope to himself, inspired deeply, and sunk, or was lowered through the water, in the hole, that he might feel the frames with his feet, and gain further knowledge, if possible, of the nature of the leak. He remained so long beneath without giving any signal, that his companion, alarmed, drew him up before he desired; and then it was found, that either of them could remain about twice as long under water, going into it from the diving bell at that depth, as they could under ordinary circumstances.

This was supposed to be accounted for, at the time, by the circumstance, that at the depth of thirty feet, the atmosphere was of double pressure, and that the lungs, therefore, held twice as much air as they could do under ordinary circumstances. It is, however, quite evident that another advantageous circumstance must have occurred, and that the air in the lungs was also better in quality than it would have been at the surface of the river, as well as denser; for supposing the deterioration by breathing to continue the same for the same time, it is clear, that every inspiration passed into the lungs twice as much pure air as would have entered under common circumstances: the injured air must, therefore, have been removed more rapidly, and the quality of that at any one time in the lungs must have risen in consequence. When to this is added the effect of double quantity, it fully accounts for the increased time of holding the breath; and had the effect of the mode of preparation now described been also added, it is probable that the time would have appeared astonishingly increased. [*Phil. Mag.*

¶ POPULAR SCIENCE.

No. VI.

On the Instincts of Birds. By JOHN BLACKWALL, *Esq. F.L.S.*

[Continued from p. 360.]

After the business of nidification is completed, parturition commences, which is succeeded by incubation, and as the birds will frequently continue to deposit their eggs in the same nest, though all except one or two should be removed as fast as they are laid, or exchanged for others of a different size and colour; and as they will sometimes, after having produced their appointed number, sit upon a single egg, or the eggs of other birds introduced for the purpose of experiment, on artificial ones of chalk, or even upon stones of any irregular figure; it is plain that the act of depositing and incubating their eggs can be ascribed to instinct only.

The parental offices of birds to their young, are also regulated by instinctive feeling, as is evinced by their bestowing the same attention on the offspring of other species, when committed to their care, as they do upon their own. Thus the titlark and hedge-warbler manifest the warmest attachment to the young cuckoos, their foster nurslings, though they suffer their own progeny, ejected by the intruders, to perish from neglect within a short distance of the nest; and this affection continues with little diminution, till their suppositious offspring have nearly attained their full growth. Yet under other circumstances they would pursue and prosecute them with the utmost rancour.

The instinctive nature of these actions is likewise satisfactorily established by the fact, that birds when taken very young and brought

up in confinement, not only construct nests occasionally, but also lay their eggs in them, which they will sit upon till hatched, should they prove prolific, and will then carefully attend to the young. An anecdote or two serving more fully to corroborate the opinion advanced above, will not, it is hoped, be unacceptable.

In the beginning of May, 1812, having found a Buzzard's nest, containing a single egg, the egg was taken, and a light coloured stone substituted for it, over which a rat trap was set. The buzzard sat upon the trap for a day and a night, when it was discovered that the iron ring which confined the spring had not been withdrawn. The ring was then removed, and on visiting the nest afterwards, the female was found caught by the feet. This change of character in so watchful and quicksighted a bird as the buzzard, is certainly very surprising, and must baffle every attempt to connect it with any intellectual process.

A highly interesting anecdote, illustrative of the attachment of the raven to its eggs, is thus admirably related by Mr. White:* "In the centre of a grove there stood an oak, which, though shapely and tall on the whole, bulged out into a large excrescence about the middle of the stem. On this a pair of ravens had fixed their residence for such a series of years, that the oak was distinguished by the title of the raven-tree. Many were the attempts of the neighbouring youths to get at this eiry; the difficulty whetted their inclinations, and each was ambitious of surmounting the arduous task. But when they arrived at the swelling, it jutted out so in their way, and was so far beyond their grasp, that the most daring lads were awed, and acknowledged the undertaking to be too hazardous. So the ravens built on, nest upon nest, in perfect security, till the fatal day arrived in which the wood was to be levelled. It was in the month of February, when those birds usually sit. The saw was applied to the butt—the wedges were inserted into the opening—the woods echoed to the heavy blows of the beetle or mallet—the tree nodded to its fall—but still the dam set on. At last, when it gave way, the bird was flung from her nest, and though her parental affection deserved a better fate, was whipped down by the twigs, which brought her, dead, to the ground."

That ardent affection which most birds feel for their young, seems to awaken their dormant energies, and to inspire them with a degree of courage and address that is called forth on no other occasion. Nor is the violence of this affection, to use the language of Mr. White, more wonderful than the shortness of its duration. Thus, every hen is, in her turn, the virago of the yard, in proportion to the helplessness of her brood, and will fly in the face of a dog or a sow, in defence of those chickens which, in a few weeks, she will drive before her in relentless cruelty. The partridge will tumble along before a sportsman, in order to draw away the dogs from her helpless covey; and a very exact observer (the Rev. John White,) has remarked, that

* Natural History of Selborne, p. 6.

a pair of ravens nestling in the Rock of Gibralter, would suffer no vulture or eagle to rest near their station, but would drive them from the hill with amazing fury; and that even the blue thrush, at the season of breeding, would dart out from the clefts of the rocks to chase away the kestril or the sparrow hawk. Indeed, so regardless of danger are some species while their nestlings are small, that I have known the redbreast, winchat, great titmouse, &c. when introduced to their nests, after having been forcibly removed to a distance from their unfledged young, remain quietly upon them as if they had not been molested. Yet, although this instinct, the transient effects of which depend, most likely, on a temporary excitation of the parental feelings by some physical modification of the corporeal organs, thus for a time powerfully predominates, its manifestations are nevertheless frequently influenced by the active co-operation of the intellectual faculties, as in the following examples:

"The fly catcher," says Mr. White,* "builds every year in the vines that grow on the walls of my house. A pair of these little birds had one year inadvertently placed their nest on a naked bough, perhaps in a shady time, not being aware of the inconvenience that followed. But a hot, sunny season coming on before the brood was half-fledged, the reflection of the wall became insupportable, and must inevitably have destroyed the tender young, had not affection suggested an expedient, and prompted the parent bird to hover over the nest all the hotter hours, while, with wings expanded, and mouths gasping for breath, they screened off the heat from their suffering offspring."

"A further instance," continues the same author,† "I once saw of notable sagacity in a willow-wren, which had built in a bank in my fields. This bird, a friend and myself had observed as she sat on her nest; but was particularly careful not to disturb her, though we saw she eyed us with some degree of jealousy. Some days after, as we passed that way, we were desirous of remarking how this brood went on; but no nest could be found, till I happened to take up a large bundle of long green moss, as it were carelessly thrown over the nest, in order to dodge the eye of any impertinent intruder."

Actuated by a similar motive, old birds, which have their young much handled, use every art to induce them to desert the nest as early as possible; and I have known the redbreast, on such occasions, take off her nestlings long before they could make the slightest use of their wings. That this mode of proceeding must be referred to intelligence, cannot, I think, be doubted, as the danger of allowing their progeny to remain in a state of insecurity is evidently perceived, and the surest means of avoiding it, deliberately adopted in consequence.

Many birds, under particular circumstances, manifest a natural inclination to fight. This disposition is remarkably conspicuous in the ruff, the quail, and the domestic cock. That the feeling is innate,

* Natural History of Selborne, p. 151. † Ibid, p. 151

and dependent upon organization, is clearly proved by the established fact, that careful breeding and training exercise a powerful influence upon the last species with regard to this propensity.

Dr. Darwin states that pheasants and partridges teach their young to select and take up their food; and hence he seems disposed to infer that all birds receive instruction in these particulars; but that they are impelled, by instinct, independently of education and experience, to exercise the functions of their various corporeal organs, whose structure is admirably adapted to the several offices they have to perform, admits of such numerous and decisive proofs, that it is truly amazing how a person of so much observation as Darwin could so entirely overlook them.

Those young birds which do not acquire the use of their eyes for several days after they are hatched, open their mouths for food as soon as they are stimulated by hunger, not only when the old ones bring it to them, but when any thing approaches the nest. Nestlings, too, as soon as they are grown sufficiently large, mute over the edge of the nest, though the parent birds carefully convey to a distance whatever drops from them that they do not succeed in ejecting. These actions occur also when the birds are brought up in confinement, however young they may be when taken, and therefore must be instinctive.

The common duck has its toes connected by a strong membrane, which enables it to swim with facility; and the young of this species, though hatched under birds which instinctively avoid committing themselves to the water, rush to it with avidity almost as soon as they are extricated from the shell, notwithstanding the utmost exertions of the foster mother to divert them from it.

Young swifts are rarely, if ever, observed to perch; and as they cannot easily be distinguished from old ones by their flight, they must display a considerable command of wing the very first time they quit the nest.

Many of the gallinaceous tribes scratch up the earth with their feet in search of food; and they will frequently repeat this action when fed on a stone or boarded floor, where it can answer no useful purpose. Now, as they do not correct this error, it is plain that the action itself does not originate in observation, experience, or reflection. Neither can it be attributed to education; nor is this particular misapplication of it to be ascribed to the force of habit, as it may often be observed in very young chickens, which have never associated with others of their kind. But, what is still more to the purpose, and indeed decisive of the general question, even pheasants and partridges, as well as ducks, chickens, turkeys, and guinea-fowls, which have been hatched by artificial heat, possess the instincts peculiar to their respective species, as I have had several opportunities of ascertaining. How young birds, by their struggles in the egg, can at all facilitate the use of their legs, as Dr. Darwin conjectures, is to me inconceivable, especially when the position in which they lie is taken into consideration. But even supposing this notion to be correct, it

does not in the least affect the instinctiveness of the act; unless we conclude with Darwin, that instinct has nothing to do with any of those actions which result from the repeated efforts of the muscles, under the conduct of the sensations or desires,—an opinion so manifestly erroneous, that it does not require a formal refutation.

[TO BE CONTINUED.]

Meteorological Observations for November, 1833.

Moon.	Days.	Therm. Sun rise.	Therm. 2 P.M.	Barometer. Sun rise.	Barometer. 2 P.M.	Wind. Direction.	Wind. Force.	Water fallen in rain.	State of the weather, and Remarks.
				Inches	Inches			Inches.	
☽	1	32°	53°	30.35	30.25	W.	Moderate.		Clear day.
	2	32	63	29.90	29.90	W.	do.		Lightly cloudy—hazy.
	3	39	49	.65	30.00	W.	do.		Hazy.
	4	36	49	30.00	.00	W. W.	do.		Cloudy—flying clouds.
	5	23	39	30.10	.90	NE. W.	do.		Clear day.
	6	29	45	.30	.05	W.	Calm		Cloudy: shower of hail: rain.
	7	39	49	.00	.10	W.	do.	0.04	Flying clouds—cloudy.
	8	39	60	.05	.10	W.	do.		Hazy.
	9	60	61	29.70	29.70	S.	do.		Cloudy—drizzle.
⊗	10	43	52	.80	.80	W.	do.		Clear day.
	11	37	52	.90	.85	W. SW.	do.		Clear—rain.
	12	37	54	.55	.55	SW.	Moderate.		Rain: flying clds: shower of [meteors.
	13	34	49	.80	.80	W.	do.		Clear day.
	14	32	50	.70	.90	S. W.	Brisk.		Hazy—clear.
	15	34	53	.35	.35	W.	do.		Cloudy day.
	16	25	37	.65	.65	W.	Moderate.		Cloudy—flying clouds.
	17	28	36	.60	.60	W.	do.		Cloudy—snow—cloudy.
	18	24	41	.80	.80	W.	do.		Clear day.
	19	26	33	30.05	30.05	W.	do.		Clear day.
	20	26	40	.20	.20	W. E.	do.		Clear day.
	21	23	48	.20	.20	S.	do.		Clear day.
☾	22	45	43	29.90	.25	NW.	do.	0.45	Rain—cloudy.
	23	31	44	.75	.75	NW.	do.		Clear—hazy.
	24	35	45	.90	.95	W.	Calm.		Cloudy—hazy.
	25	38	38	.65	.70	E.	Brisk.		Rain.
	26	32	34	.30	.30	W.	Blustering	1.15	Cloudy—flying clouds.
	27	27	33	.75	.90	W.	Moderate.		Clear day.
	28	33	41	30.00	.00	W.	do.		Clear day.
⊕	29	25	44	.95	.00	W.	do.		Clear—cloudy.
	30	40	42	29.90	29.90	SE. S W.	do.	0.16	Drizzle—rain.
	Mean	34.06	45.07	29.89	29.89			1.80	

Thermometer.		Barometer.
Maximum height during the month,	63. on 2nd.	30.33 on 5th.
Minimum do. . .	23. on 1st. 5th. & 21st.	29.35 on 15th.
Mean do. . .	39.53 .	29.88